TRANSPORT FOR LONDON

RIVER CROSSINGS: SILVERTOWN TUNNEL

SUPPORTING TECHNICAL DOCUMENTATION

EAST LONDON RIVER CROSSINGS:

ASSESSMENT OF OPTIONS

Transport for London

December 2012

This report focuses on the proposals for river crossings, namely the progression of new crossing infrastructure for road traffic between east and south east London, in the form of fixed links (bridges or tunnels), or vehicle ferries.

This report is part of a wider suite of documents which outline our approach to traffic, environmental, optioneering and engineering disciplines, amongst others. We would like to know if you have any comments on our approach to this work. To give us your views, please respond to our consultation at www.tfl.gov.uk/silvertown-tunnel

Please note that consultation on the Silvertown Tunnel is running from October – December 2014

Transport for London

East London River Crossings: Assessment of Options

Date: December 2012

MAYOR OF LONDON

Review of River Crossings: report series

A. Assessment of need

B. Assessment of options ← *this report*

CONTENTS

1. STRATEGIC CONTEXT

1.1. There is a clearly defined policy framework for London which looks forward to 2031 and defines the key challenges that London has to address over this period.

1.2. This is set out in the London Plan (the Mayor's special development strategy) and the Mayor's Transport Strategy (MTS), finalised in 2011 and 2010 respectively and providing clear policy direction through to 2031. These two documents provide the statutory framework for the boroughs to develop their own local development frameworks.

1.3. The overall thrust of these documents is that London is a growing city, with growth at the highest levels since the inter-war period. There is a focus on generating jobs and growth to meet the demands of a rising population, and transport is a critical component in helping to achieve this.

1.4. Investment in transport has helped London secure an overall reduction in the amount of car use and sustained increases in public transport, walking and cycling. It is essential that this trend continues into the future and further investment in public transport capacity is a fundamental part of this strategy. In addition, the scale of growth and concentration of this growth in the eastern parts of London means that further investment in the road network is also required.

London Plan (2011)

1.5. The London Plan (LP), published in 2011, is the statutory spatial plan for London, which sets out the strategic vision for Greater London up to 2031. The LP considered the strategic issues of the scale of growth London will need to accommodate over the next two decades, and considered alternative spatial development policies which could be adopted to meet the forecasts for population and employment growth. This included options of intensification of central London, a decentralised policy with higher levels of development in outer London, and other options including the potential of brownfield land to accommodate growth.

1.6. The LP concludes that east London, with its large areas of ex-industrial brownfield land and improving transport links, should play a major role in London's growth, and that with investment in infrastructure, many of London's new jobs and homes can be accommodated in the east sub-region (which comprises boroughs in both east and south east London). However achieving this development is likely to require investment in the infrastructure, including the road infrastructure and improving cross-river connectivity.

1.7. The London Plan forecasts an additional 650,000 jobs and an increase in population of 1.2 million up to 2031. Of these increases, 22% of the additional employment and 37% of the additional population will be in the east sub-region.

1.8. The London Plan clearly sets out the need for additional river crossings in Policy 6.4, Policy 6.12, and Table 6.1.

Mayor's Transport Strategy (2010)

1.9. The Mayor's Transport Strategy (MTS), published in 2010, sets out the transport strategy for London, based upon the work undertaken by the GLA for the London Plan. This includes the strategy for delivering the transport infrastructure needed to accommodate growth in the east sub-region, which is a key part of the London Plan's strategic vision.

1.10. The MTS identifies a wide range of policies and proposals to support this growth. It is based around three key policy areas:

(i) Better co-ordination and integration of planning and transport;

(ii) Providing new capacity;

(iii) Managing the demand to travel.

1.11. Overall, the implementation of the strategy would see the existing increase in public transport usage continue, together with an increase in cycling, and a corresponding decrease in car use.

1.12. Nevertheless, the London Plan and Mayor's Transport Strategy identify a clear need to progress a package of river crossings for east London, to help deliver growth and to meet the overall objectives of the MTS. Part of this need is a need to improve river crossings for road users, addressing the existing problems with the current infrastructure and to plan for the substantial growth that is identified for the surrounding area.

1.13. Figure 1.1 below outlines the MTS policy on river crossings.

Figure 1.1: MTS Proposal 39: River Crossings

The Mayor, through TfL, and working with the London boroughs and other stakeholders, will take forward a package of river crossings in east London, including:

a) A new fixed link at Silvertown to provide congestion relief to the Blackwall Tunnel and provide local links for vehicle traffic

b) An upgraded Woolwich Ferry and consideration of a new vehicle ferry at Gallions Reach to improve connectivity

c) Local links to improve connections for pedestrians and cyclists

d) Consideration of a longer-term fixed link at Gallions Reach to improve connectivity for local traffic, buses, cyclists and to support economic development in this area

e) The encouragement of modal shift from private cars to public transport, using new rail links including High Speed One domestic services, Crossrail and the DLR extension to Woolwich, reducing road demand, and so road congestion at river crossings, where possible

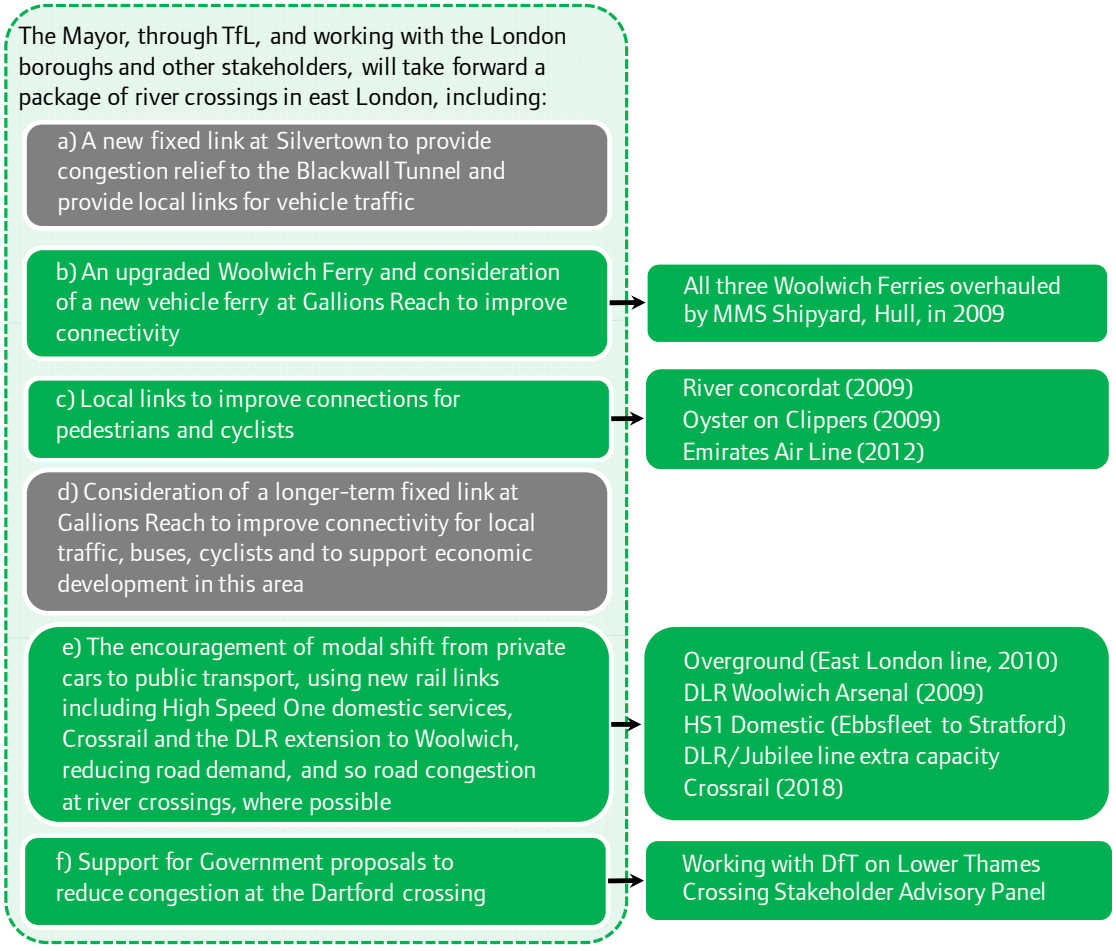
f) Support for Government proposals to reduce congestion at the Dartford crossing

1.14. Significant progress has been made in providing improved public transport services, with Crossrail still to come from 2018. Work on local cross-river links for those on foot or using cycles has resulted in the River Concordat which is an agreement between many different organisations involved in transport on the Thames to work together and improve services, extension of Oyster Pay As You Go to Thames Clipper services, and the introduction of the Emirates Air Line between Greenwich and Newham. Each of the three Woolwich ferries has been overhauled, although further decisions will be required as to their eventual replacement.

1.15. Transport for London has also been engaging closely with the Department for Transport on the options for the Dartford Crossing, including the replacement of the toll plazas with free-flow tolling, and the development of plans for new capacity at or downstream of Dartford.

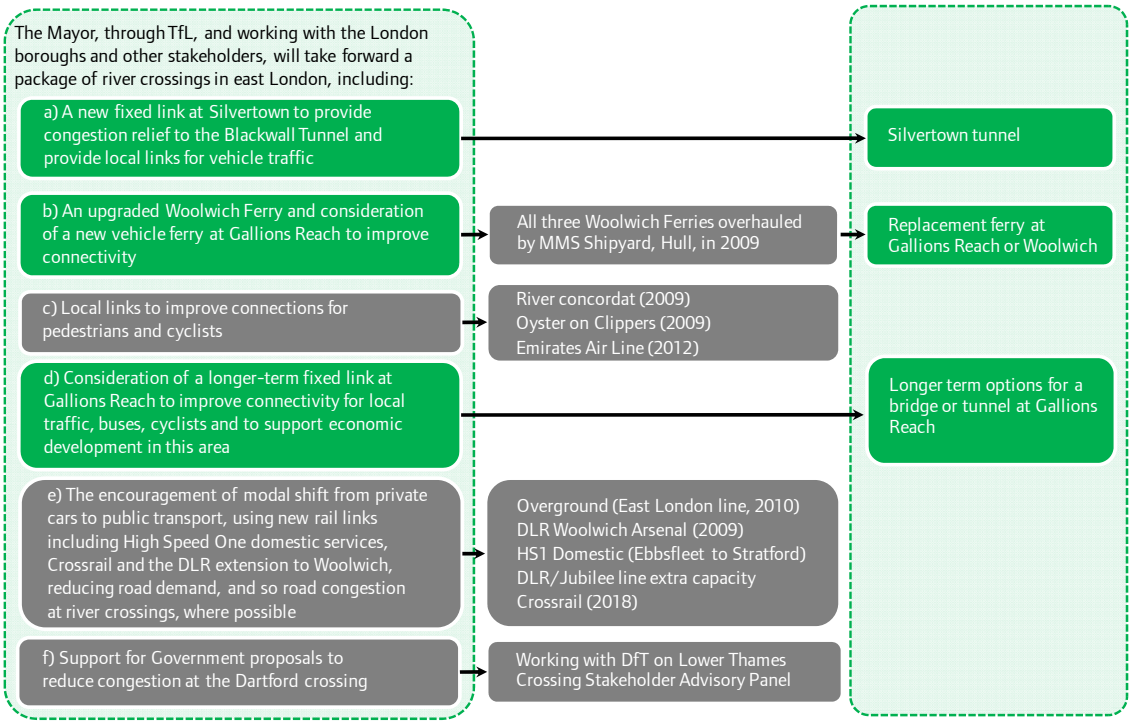
1.16. Figure 1.2 below illustrates the progress made to date.

Figure 1.2: MTS Proposal 39: River Crossings progress to date



1.17. This report therefore focuses on the outstanding proposals for river crossings, namely the progression of new crossing infrastructure for road traffic between east and south east London, in the form of fixed links (bridges or tunnels), or vehicle ferries, as illustrated below. Although the London Plan and MTS identify a package of river crossings, at this stage a number of different options have been identified and are assessed in this report.

Figure 1.3: MTS Proposal 39: River Crossings outstanding issues



Assessment of Need (2012)

1.18. TfL has already considered the needs and rationale for new river crossings as part of the London Plan and Mayor's Transport Strategy. The River Crossings Assessment of Need report[1] considers the other relevant national, regional and local polices, and reviews the current and forecast future condition of the local economy and transport networks. It concludes that the principal needs are to address:

- the imbalance between highway network capacity and demand around the Blackwall Tunnel, which results in significant congestion;
- the unreliability of the Blackwall Tunnel, and the limited ability of the surrounding road network to cope with incidents when they occur; and
- the possibility that the Woolwich Ferry may be withdrawn from service due to the condition of the asset, which would significantly reduce connectivity in the area. In assessing options for addressing this issue, consideration should be given to means of reducing current and future impacts of crossings on the road network.

1.19. Any river crossing schemes or policies should be aimed at addressing these problems to ensure that the principal needs are addressed; these are described in Department for Transport's terminology as the "investment criteria".

1.20. Taking into account the London Plan objectives for the study area and the needs identified in the Assessment of Needs report, the following local programme objectives have been identified:

- To improve the efficiency of the highway network in the London Thames Gateway, especially at river crossings, and provide greater resilience for all transport users
- To support the needs of existing businesses in the area and to encourage new business investment
- To support the provision of public transport services in the London Thames Gateway
- To integrate with local and strategic land use policies
- To minimise any adverse impacts of any proposals on health, safety and the environment
- To ensure where possible that any proposals are acceptable in principle to key stakeholders, including affected boroughs
- To achieve value for money

[1] River Crossings Assessment of Needs report, TfL, 2012

2. ASSESSING RIVER CROSSING OPTIONS

2.1. In considering options for river crossings, the assessment needs to consider the options against:

- London Plan and Mayor's Transport Strategy policies relating to river crossings;
- Other London Plan and Mayor's Transport Strategy policies;
- Specific programme objectives.

2.2. TfL has developed an assessment framework (Strategic Assessment Framework, or SAF) to enable policy options and proposals to be tested against all MTS outcomes. It is consistent with the Department for Transport's Webtag process.

Structure of the options assessment

2.3. Although the London Plan and MTS identify a package of river crossings, at this stage a number of different options have been identified and assessed. These have been grouped together as follows:

Option A – Do Nothing

Option B – Demand management and maximise public transport use

Option C – Lower cost road options

Option D – Higher cost road options

2.4. Within these broad options, there are alternative locations where these broad policy options could be implemented, for example the potential for ferry services at both Woolwich and Gallions Reach has been identified. All the most plausible options within these broad policy options have been considered and are assessed as options in this report.

2.5. This assessment of options is structured in three parts:

Part 1 – define options for testing

Part 2 – test options against the Mayor's Transport Strategy outcomes using the Strategic Assessment Framework (SAF)

Part 3 – test options against specific programme objectives

2.6. This is discussed in more detail below.

2.7. **It must be noted that in all these assessments, this is a preliminary assessment, based on the information currently held; the assessment may be updated depending on the outcomes of further technical work and public/stakeholder consultation.**

Part 1– define options for testing

2.8. Each option is defined, including the location and operational aspects of the option, grouped into the four categories listed in paragraph 2.3 above. The key characteristics are summarised, drawing out the key points influencing the option assessment scoring which is described next.

Part 2 – test options through SAF

2.9. The Mayor's Transport Strategy (MTS) published in May 2010, is a statutory document that sets out the Mayor's goals, challenges and desired outcomes for London's transport system for the next twenty years. TfL has a duty to facilitate the implementation of the MTS in the most cost effective way and monitor its delivery. A new Strategic Assessment Framework (SAF) has therefore been developed to reduce duplication of work and introduce a consistent assessment approach across TfL.

2.10. The framework allows:

- TfL planners and project managers to develop and assess projects against the MTS goals
- Alternative projects/options to be considered in more detail during the early planning stages
- An up-to-date and consistent approach for the Business to demonstrate the 'strategic fit' of projects as they proceed through the Corporate Gateway Approval Process (CGAP)
- Consistent (cross-modal) information for decision-makers
- Consistent comparison of investment scenarios against the MTS goals to attempt to ensure long-term goals are not compromised

2.11. The options have all been tested in SAF and the results are presented for all options. The Figure below shows the SAF scoring scale and the sample table shows the range of possible ratings.

Figure 2.1 – SAF scoring scale

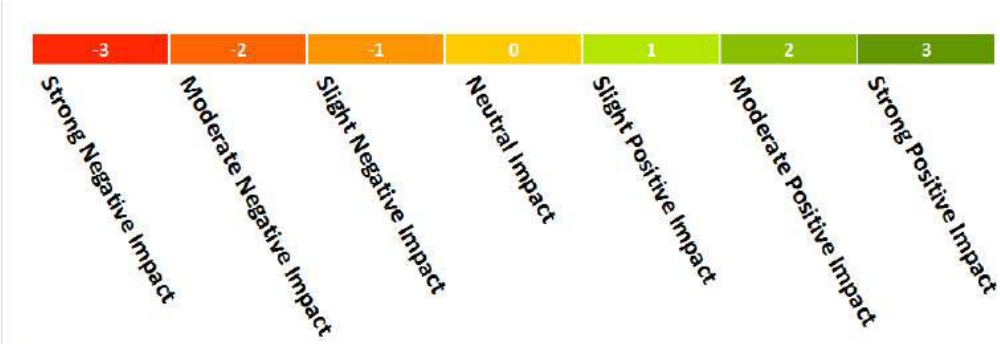


Table 2.1 – SAF summary table

MTS Challenges	MTS Outcomes	Qualitative Score
Goal 1: Support economic development and population growth		
Supporting sustainable population and employment growth	Balancing capacity and demand for travel through increasing public transport capacity	Strong Negative
	Balancing capacity and demand for travel through reducing the need to travel	Moderate Negative
Improving transport connectivity	Improving people's access to jobs	Slight Negative
	Improving access to commercial markets for freight movements and business travel	Neutral
Delivering an efficient and effective transport system for goods and people	Smoothing traffic flow (managing delay, improving journey time reliability and resilience)	Slight Positive
	Improving public transport reliability	Moderate Positive
	Reducing operating costs	Strong Positive
	Bringing and maintaining all assets to a state of good repair	Moderate Positive
	Enhancing use of the Thames for people and goods	Slight Positive
Goal 2: Quality of Life		
Improving journey experience	Improving public transport customer satisfaction	Neutral
	Improving road user satisfaction (drivers, pedestrians, cyclists)	Slight Negative
	Reducing public transport crowding	Moderate Negative
Enhancing the built and natural environment	Enhancing streetscape, improving the perception of urban realm and developing 'better streets' initiatives	Strong Negative
	Protecting and enhancing the natural environment	Moderate Negative
Improving air quality	Reducing air pollutant emissions from ground based transport, contributing to EU air quality targets	Slight Negative
Improving noise impacts	Improving perceptions and reducing impacts of noise	Neutral
Improving health impacts	Facilitating an increase in walking and cycling	Slight Positive
Goal 3: Safety and security		
Reducing crime, fear of crime and anti-social behaviour	Reducing crime rates (and improving perceptions of personal safety and security)	Moderate Positive
Improving road safety	Reducing the numbers of road traffic casualties	Strong Positive
Improving public transport safety	Reducing casualties on public transport networks	Moderate Positive

Goal 4: Transport Opportunities		
Improving accessibility	Improving the physical accessibility of the transport system	Slight Positive
	Improving access to services	Neutral
Supporting regeneration and tackling deprivation	Supporting wider regeneration	Slight Negative
Goal 5: Climate change		
Reducing CO_2 emissions	Reducing CO_2 emissions from ground based transport, contributing to a London-wide 60% reduction by 2025	Moderate Negative
Adapting for climate change	Maintaining the reliability of transport networks	Strong Negative
Goal 6: Support delivery of the London 2012 Olympic and Paralympics Games and its lega		
Developing and implementing a viable and sustainable legacy for the 2012 Games	Supporting regeneration and convergence of social and economic outcomes between the five Olympic boroughs and the rest of London	Moderate Negative
	Physical transport legacy	Slight Negative
	Behavioural transport legacy	Neutral

Deliverability and Risks		
Issue	**Assessment Criteria**	
Deliverability and Acceptability Risks	Engineering feasibility risk	Low
	Complexity of delivery (risk)	Medium
	Consent risk	High
	Funding risk	Medium
	Stakeholder acceptability risk	Low
	Public acceptability risk	Medium
	Overall deliverability risk	High
Complexity of operation	Operational feasibility risk	Medium
Value for Money	Benefit Cost Ratio	> 4
Affordability and Financial Sustainability	CAPEX	£50m < £200m
	OPEX per annum	£10m <£500m
	Revenue implications per annum	£1m < £2m
	Funding potential within TfL budget	Medium
	Funding potential with private finance, e.g. via S106, securitisation of revenue, and DfT	Low
Timescales	Timescale for delivering the changes	Medium-term
	Program risk	Low

Part 3 – test options against programme objectives

2.12. Following the SAF assessment against the general policies of the MTS, the options have been tested against the more local programme objectives set out in paragraph 1.20.

2.13. These overall programme objectives have been expanded as shown below; note that the measures for improving the efficiency of the highway network and to support businesses are shown together due to the high degree of overlap between the measures which support these objectives.

Table 2.2 – Programme objective assessment

Programme objective	Measure	Description
To improve the efficiency of the highway network in the London Thames Gateway, especially at river crossings, and provide greater resilience for all transport users	Peak Blackwall congestion	How well does the option address the peak period congestion at the Blackwall tunnel?
	Blackwall crossing resilience	Does the option improve the reliability of the Blackwall tunnel?
	Cross-river connectivity downstream of the Greenwich Peninsula	Does the option improve crossing connectivity downstream of the Greenwich Peninsula?
	Approach road independence	Does the option provide independent approach roads serving the different crossings?
To support the needs of existing businesses in the area and to encourage new business investment	Local road reliability (Greenwich)	Does the option improve the reliability of traffic on local roads in the Greenwich/Charlton areas?
	Local road reliability (Woolwich)	Does the option improve the reliability of traffic on local roads in the Woolwich area?
	Local road reliability (Bexley)	Does the option improve the reliability of traffic on local roads in the Bexley area?
	Local road reliability (Royal Docks)	Does the option improve the reliability of traffic on local roads in the Royal Docks area?
	Journey times across sub-region (peak)	How well does the option improve journeys times across the east sub-region during peak periods?
	Journey times across sub-region (off-peak)	How well does the option improve journey times across the east sub-region during off-peak periods?
To support the provision of public transport services in the London Thames Gateway	Reliability of local buses	How will the option affect reliability of local bus services?
	Allows new orbital public transport links	Does the option allow for improved orbital public transport services?
	Mode shift potential, car to public transport	Potential to divert car drivers from congested crossings onto public transport

To integrate with local and strategic land use policies	Lower Lea Valley OA	Does the option support the planned development/growth in the Lower Lea Valley OA?
	Greenwich Peninsula OA	Does the option support the planned development/growth in the Greenwich Peninsula OA?
	Royal Docks OA	Does the option support the planned development/growth in the Royal Docks OA?
	London Riverside OA	Does the option support the planned development/growth in the London Riverside OA?
	Bexley Riverside OA	Does the option support the planned development/growth in the Bexley OA?
	Thamesmead & Abbey Wood OA	Does the option support the planned development/growth in the Thamesmead & Abbey Wood OA?
	Woolwich OA	Does the option support the planned development/growth in the Woolwich OA?
	Charlton Riverside OA	Does the option support the planned development/growth in the Charlton Riverside OA?

To minimise the adverse impacts of any proposals on health, safety and the environment	Local air quality	Likely impact on local air quality
	Walking & cycling	Potential impact on levels of walking and cycling
	Road safety	Potential impact on road safety
	Environment	Potential impact on the environment

To ensure that any proposals are acceptable in principle to key stakeholders, including affected boroughs	Local boroughs	General level of support amongst affected boroughs; in particular, would the scheme conflict with any boroughs' stated views
	Other stakeholders	General level of support amongst other key stakeholders such as the Port of London Authority or Environment Agency

To achieve value for money	Business case	Likely business case of option
	Wider economic benefits	Potential to generate wider economic benefits
	Low cost for users	Does the option impose new costs on users at existing crossings?
	CIL funding potential	Potential to generate Community Infrastructure Levy (CIL) funding or similar (how many major development areas benefit?)
	Potential for user revenue to offset costs	Potential for user revenue to offset costs
	Capital cost	Capital cost to implement the option

Note: OA = Opportunity Area

2.14. The assessment has been undertaken for the following packages:

Option A – Do Nothing

Option B – Demand management and maximise public transport use

Option C – Lower cost road options

Option D – Higher cost road options

2.15. Options B, C and D have been assessed against a Do Minimum scenario, which entails maintaining a ferry service at Woolwich.

3. DO NOTHING (OPTION A)

Introduction

3.1. Within the study area there are two existing vehicular crossings, the Blackwall tunnel and Woolwich ferry. The option exists of doing nothing, which is deliverable, and requires no major capital investment to deliver (although some investment in the infrastructure is likely to be required to keep it in a good state of repair).

3.2. This section outlines the performance of the Do Nothing option against the SAF and the programme objectives.

OPTION A: DO NOTHING

Option A – description

3.3. Under the Do Nothing scenario, it is assumed that the Blackwall tunnel continues to function as it does currently. Without significant investment, the Woolwich Ferry will need to close in the coming years, because the current boats and landside infrastructure were built in the early 1960s, and are in need of heavy maintenance. The risks associated with continued operation are also increasing over time, as in the event of a major mechanical failure, there will be a need to procure bespoke parts and potentially close the service until repairs can be effected.

3.4. This option assumes that the Woolwich ferry would be retained as at present for as long as is practicable with the infrastructure available; it is assumed then to close by 2024.

3.5. It should be noted however that there is a legal obligation on TfL to operate the Woolwich ferry service. The Woolwich Ferry is operated according to the Metropolitan Board of Works (Various Powers) Act 1885, with the obligations being transferred to TfL by the Greater London Authority Act 1999 and the Woolwich Ferry Order 2000.

3.6. Unless the Woolwich Ferry enactments are repealed or amended it would not be possible for TfL to close the Woolwich Ferry.

3.7. This is a major obstacle to this option, and as such it is not strictly speaking a 'Do Nothing' option, as the closure powers would need to be attained. However it is a Do Nothing option in as far as the infrastructure is concerned.

Option A – Assessment against SAF

3.8. The table below summarises the option against the Strategic Assessment Framework.

MTS Challenges	MTS Outcomes	Qualitative Score	Comments
Goal 1: Support economic development and population growth			
Supporting sustainable population and employment growth	Balancing capacity and demand for travel through increasing public transport capacity	Slight Negative	Closure of Woolwich ferry would mean loss of a walk and cycle route Worsening delays at Blackwall would negatively affect the local bus services
	Balancing capacity and demand for travel through reducing the need to travel	Neutral	Does not affect the need to travel, just reduces the available capacity
Improving transport connectivity	Improving people's access to jobs	Slight Negative	Reduces cross river connectivity therefore access to jobs would get worse
	Improving access to commercial markets for freight movements and business travel	Moderate Negative	Closure of Woolwich ferry would have a major impact on freight movements, due to restrictions at Blackwall some HGVs would need to divert via the Dartford crossing
Delivering an efficient and effective transport system for goods and people	Smoothing traffic flow (managing delay, improving journey time reliability and resilience)	Moderate Negative	Worsening reliability at Blackwall (2 minutes extra delay in reference case)
	Improving public transport reliability	Slight Negative	Increased congestion around Blackwall would impact on local bus routes reliability
	Reducing operating costs	Slight Positive	In the short term operating costs of Woolwich ferry would increase, but after it closes, in the long term operating costs would be reduced
	Bringing and maintaining all assets to a state of good repair	Neutral	Woolwich ferry would be maintained in working order until it is no longer feasible to do so. Excessive maintainance costs and eventually loss of an asset
	Enhancing use of the Thames for people and goods	Strong Negative	Reduction in the number of river crossings, which would mean more congestion at other crossings, long diversions for certain restricted vehicles, and less network resilience
Goal 2: Quality of Life			
Improving journey experience	Improving public transport customer satisfaction	Slight Negative	Increased congestion would negatively effect reliability on local bus routes
	Improving road user satisfaction (drivers, pedestrians, cyclists)	Strong Negative	Loss of existing river crossing (reduced connectivity and resilience), and additional congestion at remaining crossings
	Reducing public transport crowding	Neutral	No impact
Enhancing the built and natural environment	Enhancing streetscape, improving the perception of urban realm and developing 'better streets' initiatives	Slight Negative	Pedestrians and cyclists would be forced to use the Woolwich foot tunnel which is less pleasant than the ferry
	Protecting and enhancing the natural environment	Slight Positive	Better for the river (less infrastructure)
Improving air quality	Reducing air pollutant emissions from ground based transport, contributing to EU air quality targets	Moderate Negative	Woolwich ferry trips would need to divert either via Blackwall (more congestion) or Dartford (longer journeys), both would create more emissions
Improving noise impacts	Improving perceptions and reducing impacts of noise	Neutral	No impact
Improving health impacts	Facilitating an increase in walking and cycling	Neutral	River crossing would still be possible through the Woolwich foot tunnel
Goal 3: Safety and security			
Reducing crime, fear of crime and anti-social behaviour	Reducing crime rates (and improving perceptions of personal safety and security)	Neutral	No impact
Improving road safety	Reducing the numbers of road traffic casualties	Slight Negative	Woolwich journeys diverting via Dartford would increase road kms, which would increase associated road casualties
Improving public transport safety	Reducing casualties on public transport networks	Neutral	No impact

Goal 4: Transport Opportunities			
Improving accessibility	Improving the physical accessibility of the transport system	Neutral	Miminal negative impact on bus reliability, but would not affect how easy it is to use public transport
	Improving access to services	Slight Negative	Loss of cross river walk and cycle route across the river which would mean worse access to local services
Supporting regeneration and tackling deprivation	Supporting wider regeneration	Slight Negative	Loss of a walk and cycle river crossing point at Woolwich which is one of the London Plan Opportunity Areas. The tunnel would still be available
Goal 5: Climate change			
Reducing CO_2 emissions	Reducing CO_2 emissions from ground based transport, contributing to a London-wide 60% reduction by 2025	Moderate Negative	Woolwich ferry trips would need to divert either via Blackwall (more congestion) or Dartford (longer journeys), both would create more emissions
Adapting for climate change	Maintaining the reliability of transport networks	Strong Negative	Loss of a strategic river crossing would have a negative effect on the transport network resilience
Goal 6: Support delivery of the London 2012 Olympic and Paralympics Games and its legacy			
Developing and implementing a viable and sustainable legacy for the 2012 Games	Supporting regeneration and convergence of social and economic outcomes between the five Olympic boroughs and the rest of London	Strong Negative	Loss of a cross river link in the east, which would worsen the social and economic outlook, in comparison to other non-Olympic areas of London which would stay the same or improve
	Physical transport legacy	Neutral	No impact
	Behavioural transport legacy	Neutral	No impact

Deliverability and Risks		**Option 1**	
		Do nothing	
Issue	**Assessment Criteria**	**Qualitative Score**	**Comments**
Deliverability and Acceptability Risks	Engineering feasibility risk	Low	Decommisionning the ferry
	Complexity of delivery (risk)	Low	
	Consent risk	High	TfL would need to change legislation
	Funding risk	Low	Already funding the ferry and then it would close
	Stakeholder acceptability risk	High	
	Public acceptability risk	High	
	Overall deliverability risk	High	Legally difficult
Complexity of operation	Operational feasibility risk	Low	Maintainence of ferry would get progressively more complex, but TfL would decommission it when it was no longer viable
Value for Money	Benefit Cost Ratio	Unknown	Not quantified
Affordability and Financial Sustainability	CAPEX	£10m < £50m	£15m to decomission
	OPEX per annum	< £0.5m	This is the operating cost after decommissioning (ie in the long term - nothing)
	Revenue implications per annum		No revenue
	Funding potential within TfL budget	High	TfL already funding ferry
	Funding potential with private finance, e.g. via S106, securitisation of revenue, and DfT	Low	
Timescales	Timescale for delivering the changes	Medium-term	Legally complex
	Program risk	Medium	May not be possible

Option A – Assessment against programme objectives

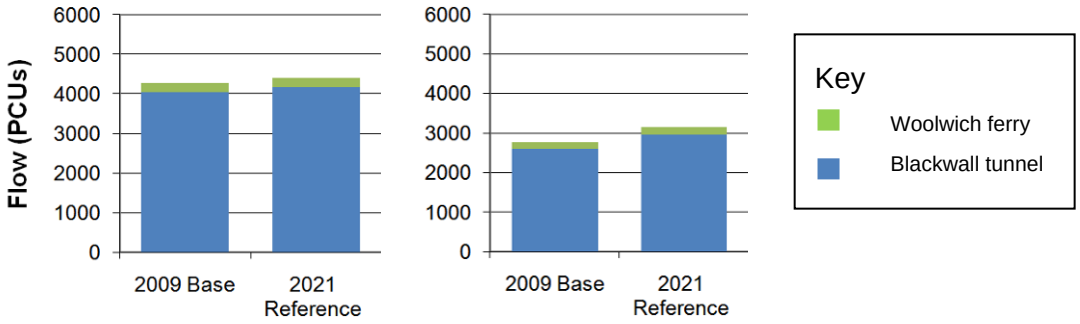
Option A – improving the efficiency of the highway network

Peak congestion

3.9. With 37% of London's projected population and 22% of London's employment growth over the next 20 years occurring in the east sub-region, the crossings are forecast to come under increasing strain. TfL's highway models forecast that demand in the morning peak will increase in the years to 2031. This will bring a significant increase in congestion, and it is likely that there would be an accompanying rise in incidents, with more accidents, breakdowns and overheight vehicle incidents.

3.10. The graphs below show the forecast changes in flow at the Blackwall tunnel and Woolwich Ferry between the modelled base year (2009) and 2021.

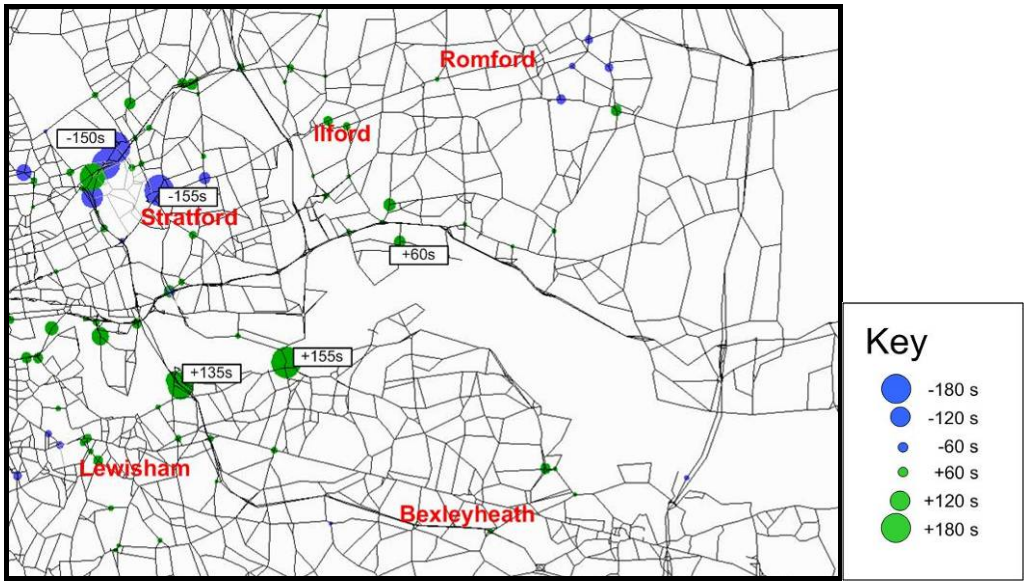
Figure 2.1 – forecast morning peak flow changes northbound (left) and southbound (right)



3.11. The growth is limited, especially in the peak direction, by a lack of capacity on the road network to accommodate additional traffic, as the network is saturated at the crossings, which is inhibiting movement at busy times. Underlying demand growth constrained by capacity will result in increased delays and unmet demand to make trips.

3.12. The models forecast increases in delay at both the Blackwall tunnel and Woolwich ferry, which will be at the heart of an ever busier part of London (see below).

Figure 2.2 – forecast changes in delay (seconds) in morning peak, 2009 to 2021



3.13. When the Woolwich ferry closes under this Do Nothing option, local cross-river trips currently undertaken by means of the Woolwich ferry would be diverted after its closure to other, more distant crossings; for many cars and some goods vehicles, this would entail a diversion to the Blackwall Tunnel, which is already severely congested at certain times of day, and has no spare capacity to accommodate diverted ferry users during the peaks.

3.14. Even the relatively small flows carried by the Woolwich ferry would increase congestion, increasing both journey length and times for existing ferry users, and adding journey time for other users of the Blackwall tunnel.

3.15. For certain vehicles, notably those over 4 metres in height, or carrying certain flammable loads, the Blackwall tunnel is not a viable location, and these vehicles would have a longer diversion, many likely to opt for the Dartford crossing. This also operates at capacity at certain times of day, so even a small diversion of traffic, especially large goods vehicles, would have a negative effect on congestion and delays.

Crossing resilience and network reliability

3.16. As well as routine severe congestion, the Blackwall Tunnel also suffers from regular incidents which cause the crossing to close, due to narrow lanes, low headroom and relatively tight bends. Between January and September 2012, there were between 93 and 144 incidents each month.

3.17. When incidents do occur, the closure of the Blackwall tunnel in either direction causes substantial congestion over a wide area, and a key objective is to reduce the likelihood, and extent, of disruption due to incidents at Blackwall.

3.18. The costs of unreliability are very significant; of those cross-river trips directly affected by closures, a cost of around £16 million per annum is incurred. In addition, as this traffic seeks to use alternative routes which are already busy or congested,

there is a very substantial knock-on effect on other local trips which is likely to affect at least as many users as those seeking to use the Blackwall tunnel.

3.19. With the Woolwich ferry closing under this option, there would not only be a greater volume of traffic overall seeking to use the Blackwall tunnel, the diverted traffic would include a high number of large goods vehicles, which would increase the likelihood of incidents at the Blackwall tunnel.

Journey times

3.20. Under this option, the capacity and free-flow journey times would remain as today at the Blackwall tunnel, although in busy periods the increases in demand to cross will increase the queues and extend journey times due to greater congestion. This will have an impact on road users seeking to make cross-river trips, and will impact upon local businesses needing to move people or goods across the Thames.

3.21. The loss of the Woolwich ferry would have a major impact on journey times for those currently using the crossing. Local cross-river trips diverting to the Blackwall or Dartford crossings would result in much longer journeys and potentially much increased journey times; this would be particularly true for high vehicles which are unable to divert to the Blackwall tunnel.

Option A – supporting the public transport network

3.22. There are committed schemes for significantly improved public transport links; in particular, Crossrail is currently under construction with a river crossing at Woolwich. Under a Do Nothing option, with a more congested and less reliable Blackwall tunnel, local bus services in the area are likely to suffer worsening reliability as a result of the knock-on effects of tunnel incidents.

Option A – integrating with land use policies

3.23. The existing problems related to poor reliability of the crossings and long journey times will worsen over time with background growth, and would be particularly worsened by the loss of the Woolwich ferry.

3.24. This would have a negative effect on the regeneration potential of the area, and in particular those Opportunity Areas along both sides of the Thames. There are already issues of development viability, and worsening transport links would discourage further development.

3.25. The crossing safeguarding restricts the development potential of areas along the route of the Silvertown Crossing and the former Thames Gateway Bridge at Gallions Reach. If a policy of no new crossings was adopted, it is likely that the safeguarding could be challenged by landowners and/or developers. The safeguarding may be upheld but there would be a risk that inaction on crossings could result in the loss of the safeguarding and the loss of ability to provide the crossings should the need become more apparent in future years.

Option A – impacts on health, safety and the environment

3.26. The existing Woolwich ferry infrastructure would need to be removed, which would have some minor implications for the river, including the need to relocate the PLA radar currently located on one pier (although this is the case for all options, given the need to replace this old pier; this point is therefore not repeated through all options.)

3.27. The removal of the Woolwich ferry service would have a minor negative health and environmental impact given the likely increase in traffic congestion and the loss of a walking and cycling route.

3.28. The reassignment of large goods vehicles from the Woolwich ferry to the restricted size Blackwall tunnel is likely to have a negative effect on road safety, and the additional queues would have negative air quality impacts.

Option A – borough and other stakeholder views

3.29. All relevant local boroughs support action to address the current problems associated with the river crossings. Doing nothing is therefore likely to be opposed by all the local boroughs, and loss of the Woolwich ferry without replacement may be very difficult to achieve in the face of TfL's obligation to maintain the service and borough opposition to its closure without reasonable alternative provision for these users.

3.30. Other local stakeholders, such as businesses in the area, are also likely to oppose doing nothing, as traffic conditions will continue to worsen.

Option A – achieving value for money

3.31. Financially, allowing the Woolwich ferry to close would save TfL operational costs, although the decommissioning and removal of the old Woolwich ferry infrastructure could cost around £7 million at current prices (or around £12 million including risk and inflation). However, it would also have a negative impact on local connectivity and congestion, and as such it would have significant costs for road users, and a negative effect on local businesses and the economy.

Option A – Programme objective summary

3.32. The table below summarises a Do Nothing scenario against the programme objectives.

		A. Do nothing
To improve the efficiency of the highway network in the London Thames Gateway, especially at river crossings, and provide greater resilience for all transport users	Peak Blackwall congestion	Slight Negative
	Blackwall crossing resilience	Slight Negative
	Connectivity east of Greenwich	Moderate Negative
	Approach road independence	Slight Negative
	Local road reliability (Greenwich)	Slight Negative
	Local road reliability (Woolwich)	Slight Negative
To support the needs of existing businesses in the area and to encourage new business investment	Local road reliability (Bexley)	Neutral
	Local road reliability (Royal Docks)	Neutral
	JTs across sub-region (peak)	Slight Negative
	JTs across sub-region (off-peak)	Neutral
To support the provision of public transport services in the London Thames Gateway	Reliability of local buses	Slight Negative
	Allows new orbital public transport	Neutral
	Mode shift potential, car to public	Neutral
To integrate with local and strategic land use policies	Lower Lea Valley OA	Neutral
	Greenwich Peninsula OA	Slight Negative
	Royal Docks OA	Slight Negative
	London Riverside OA	Neutral
	Bexley Riverside OA	Slight Negative
	Thamesmead & Abbey Wood OA	Slight Negative
	Woolwich OA	Slight Negative
	Charlton Riverside OA	Neutral
To minimise the impacts of any proposals on health, safety and the environment	Health	Slight Negative
	Safety	Slight Negative
	Environment	Slight Negative
To ensure where possible that any proposals are acceptable in principle to key stakeholders, including affected boroughs	Local boroughs	Strong Negative
	Other stakeholders	Moderate Negative
To achieve value for money	Business case	Slight Negative
	Wider economic benefits	Moderate Negative
	Low cost for users	Neutral
	CIL funding potential	Neutral
	Potential for user revenue to offset	Neutral
	Capital cost	Neutral

Assessment of Option A (Do Nothing) – conclusion

3.33. Under the Do Nothing scenario, the Blackwall tunnel continues to function as it does currently; the Woolwich Ferry would be retained as at present for as long as is practicable with the infrastructure available; it is assumed then to close by 2024.

3.34. This option has been assessed against the MTS goals and outcomes using SAF and the specific programme objectives.

Goal 1 – support economic development and population growth

3.35. The option performs negatively against this goal, as it would result in reduced capacity to cross the Thames in an area experiencing high population growth and with the potential to support high employment growth given the appropriate infrastructure.

Goal 2 – quality of life

3.36. The option performs negatively against this goal, due to increased levels of congestion, increased unreliability on the road network, and increased associated disruption and pollution.

Goal 3 – safety and security

3.37. The option performs negatively overall against this goal, due to an increase in trip lengths caused by the closure of the Woolwich ferry without replacement.

Goal 4 – transport opportunities

3.38. The option performs negatively against this goal, due to the loss of the Woolwich ferry crossing without replacement.

Goal 5 – climate change

3.39. The option performs negatively against this goal, due to an increase in trip lengths caused by the closure of the Woolwich ferry without replacement and a reduction in network resilience.

Goal 6 – support delivery of the London 2012 Olympic and Paralympic Games and its legacy

3.40. The option performs negatively against this goal, as the loss of the Woolwich ferry and increased congestion at the Blackwall tunnel will limit the ability of these areas to harness regeneration opportunities.

Programme objectives

3.41. While the Do Nothing scenario would be cheap for TfL, neither the MTS policies nor the programme objectives would be satisfied. There would be strong opposition from all the local boroughs to remaining with the status quo, and it would not accord with London Plan policy to allow for growth in east London. There would also be legal issues associated with the closure of the Woolwich ferry, which would be almost inevitable over the next 15 years due to the age of the current infrastructure; failing to plan for replacement of this facility would be highly undesirable.

3.42. With no active policies to address the imbalance between demand and capacity, the congestion at the Blackwall Tunnel will worsen against a background of local growth, and the implications of that congestion will be greater.

3.43. While the scheme represents relatively good value for TfL – as it requires no capital expenditure – in the round it offers very poor value for London, as the costs associated with the poor performance of the Blackwall tunnel will continue to increase, and will be incurred by local people and businesses in an area which is designated for future growth.

3.44. As a result, **the Do Nothing option is not recommended**, provided that alternative proposals demonstrate a positive case overall compared with Do Nothing.

4. DEMAND MANAGEMENT AND MAXIMISING PUBLIC TRANSPORT USE (OPTION B)

Introduction

4.1. TfL has considered a scenario whereby the no new road crossings are built, with a strategy of demand management and maximising modal shift to public transport to reduce the imbalance of demand and highway capacity.

4.2. Public transport links in the wider area have already seen very significant investment, with new cross-river links provided on these routes:

(i) Jubilee line (opened 1999, and subsequently enhanced with more frequent and longer trains);

(ii) Docklands Light Railway (extended to Greenwich and Lewisham in 1999, and subsequently enhanced with longer trains, and to Woolwich in 2009);

(iii) High Speed 1, which started operating frequent high speed trains between Kent and east London in 2009;

(iv) London Underground's East London line was transferred to the London Overground network, with new services to a much wider range of destinations from 2010, and further services from 2012.

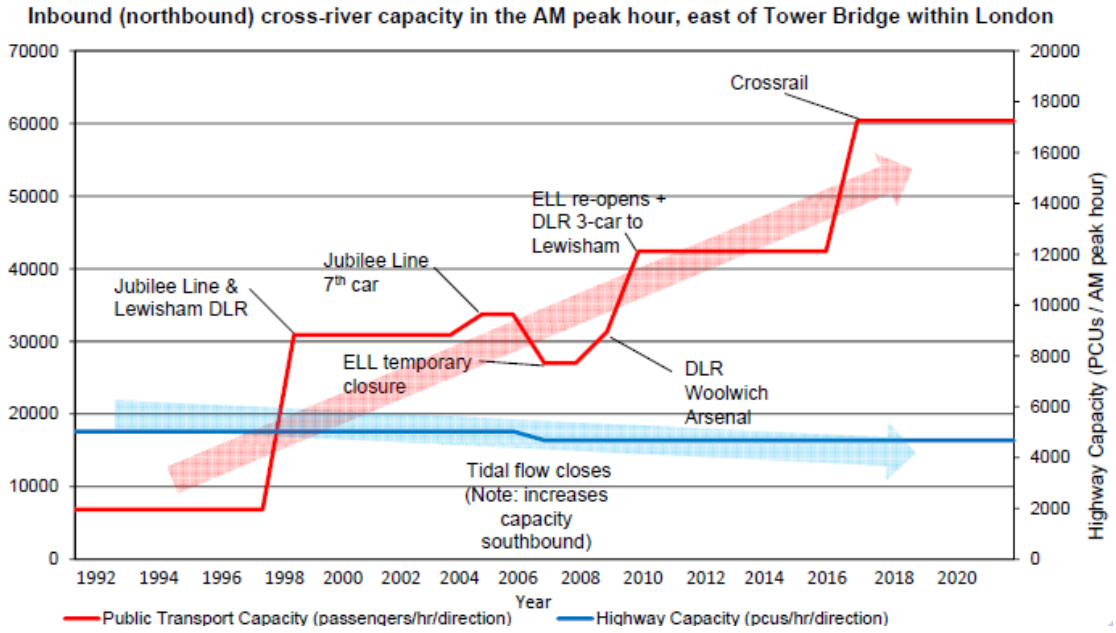
(v) Crossrail, now under construction and which will provide a new high frequency cross-river link to Woolwich from 2018.

4.3. These improvements have already led to a large increase in cross-river public transport trips in the area, but the growth in demand due to the major economic growth is such that highway demand by users not catered for by the new public transport links has continued to outstrip highway capacity considerably.

4.4. Since traffic using the Blackwall Tunnel includes both private and commercial vehicles, with a wide range of origins, destinations and journey purposes, it is considered unlikely that yet further new rail capacity could in itself achieve a significant degree of modal shift.

4.5. The Figure below illustrates the scale of new public transport capacity across the Thames in east London compared with highway capacity over the same period.

Figure 3.1 – public transport and highway capacity, 1992-2022



4.6. The existing and committed public transport crossings have very significant levels of capacity, and there is scope with additional services to increase the capacity of several of these links without major construction.

4.7. The table below illustrates the reference case capacity of the various crossings in the area (that is, including only committed enhancements); it also shows the maximum potential capacity should the crowding levels demand it, through provision of additional and/or longer trains.

Crossing	Ref case capacity~ (pax/hr)	Potential max capacity~ (pax/hr)
DLR Cutty Sark – Island Gardens	11,900	17,850*
Jubilee North Greenwich – Canary Wharf	24,720	27,192#
Jubilee Canning Town – North Greenwich	19,776	27,192#
DLR Woolwich Arsenal – King George V	7,425	17,850**
Crossrail Woolwich – Custom House	12,000	18,000***
Emirates Air Line	2,500	2,500

~ If standardised at seated plus 4 standees per square metre

* With additional vehicles and North Route (Bow-Stratford) double tracking in place

** With additional vehicles and higher frequencies (although a more likely intermediate step would be to ~9,000pax/hr with solely additional vehicles to put 3-car Stratford-Woolwich in place)

*** With 30tph core service, 18tph on Abbey Wood branch

With additional trains cascaded from Northern line fleet to give 33tph service

4.8. It should also be noted that the highway crossings all operate at full capacity throughout the peak period; while public transport is well used, it is forecast even in future years that peak demand can be accommodated on cross-river public transport links, albeit with some degree of standing and crowding.

Potential for modal shift

4.9. Users of the Blackwall tunnel are coming from a variety of origins, and travelling to a variety of destinations; for some users of the tunnel there may be a reasonable public transport alternative which is not being used for some reason (cost, health / accessibility needs, need to make multiple journeys, need to carry goods or tools). For others, it may be the case that the public transport alternative is inconvenient and unattractive.

4.10. For the latter group in particular, there is the potential to consider whether further investment in new public transport connectivity or road user charging would make driving less attractive, and hence enable a shift from private car use to public transport, reducing the demand for the Blackwall tunnel and alleviating congestion.

4.11. Roadside interview surveys were undertaken at the Blackwall tunnel in 2008 and 2009 to improve our understanding of the trips being made through the Blackwall tunnel today; this data can be reviewed to establish whether there are any patterns in the use of the tunnel which would suggest whether there are any opportunities for reducing car use through improving public transport.

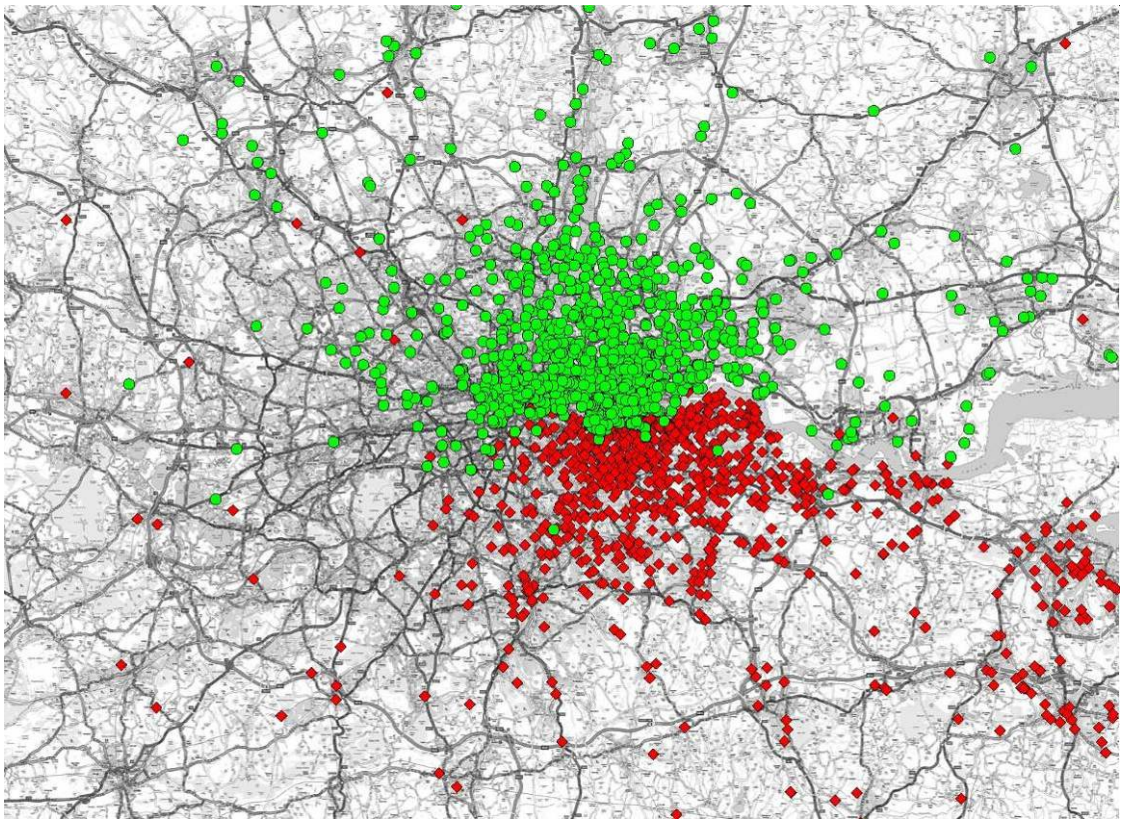
Driver origins/destinations

4.12. In the roadside interview surveys, all types of motorists were interviewed, including goods vehicles; however, it is clearly unlikely that urban goods traffic can easily be diverted to public transport. (More strategically, greater use of the rail network for freight is supported by TfL, but at the Blackwall tunnel most traffic is much too local and time sensitive to be a candidate for rail freight.) The analysis following therefore concentrates on the data gathered from the drivers of private cars.

4.13. The analysis is based on northbound survey data only, due to the difficulties in safely undertaking a southbound survey. In the survey, the Metropolitan Police directed a random sample of vehicles off the Blackwall Tunnel southern approach into Tunnel Avenue, where the driver was asked questions about their journey; data on vehicle type etc. was also noted by the interviewers. Such a survey is difficult and costly to undertake at this location, requiring Police intervention at the tunnel mouth. A total of 694 car drivers were interviewed in the roadside surveys, out of a total of 25,285 car trips over the same period. This represents a sample size of only around 2.7%.

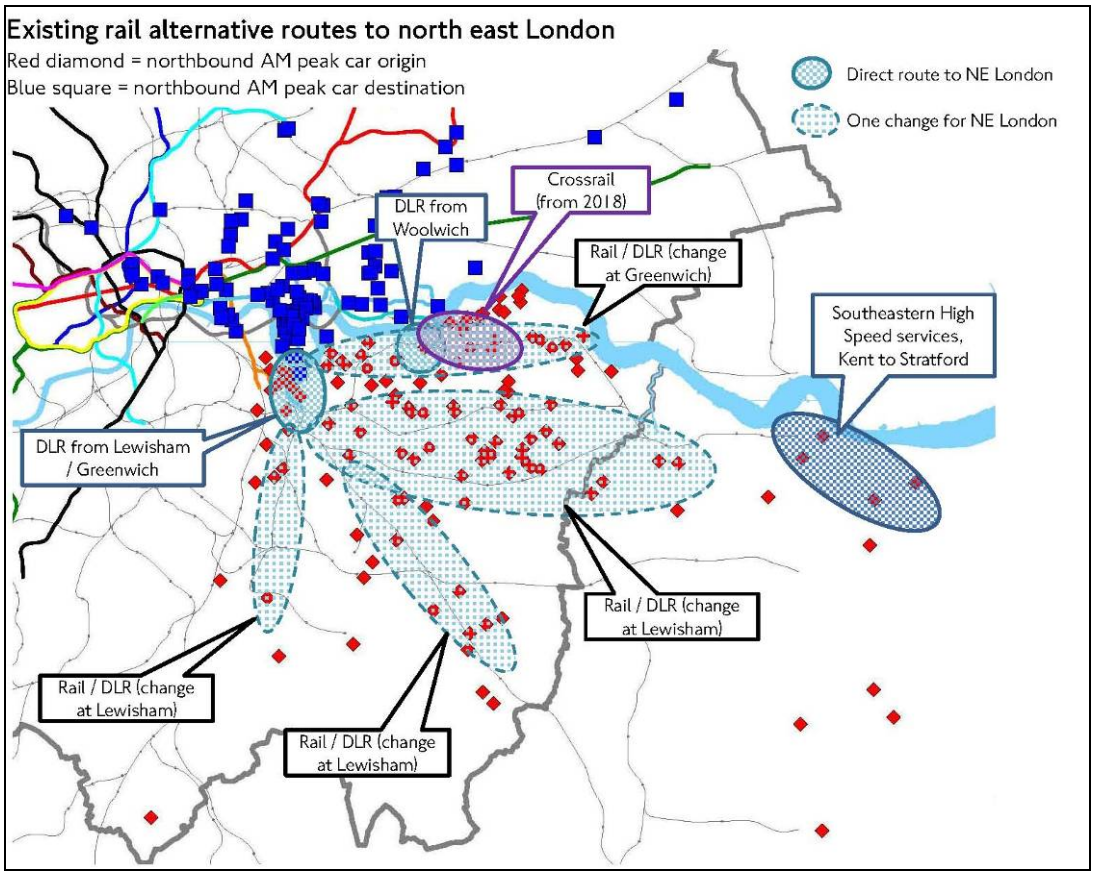
4.14. The Figure below illustrates the origins and destinations of Blackwall tunnel users as a whole (all vehicle types, all day). There is a clear bias toward trips with an origin or destination within Greater London; 75% of all origins and 83% of all destinations are within Greater London. A secondary cluster is visible in the Medway/Maidstone area of Kent, from where the A2 and Blackwall tunnel provide a convenient route to Docklands and central, north and east London.

Figure 3.2 - Blackwall tunnel (northbound) origins in red, destinations in green (all day, all vehicles)



4.15. The Figure below shows the origins and destinations of surveyed morning peak car drivers, the group which is most likely to be able to switch mode of travel. (Note that in some locations, there may be multiple origins or destinations at the same location.)

Figure 3.3 - Blackwall car drivers and rail alternative routes



4.16. The plan shows that for the majority of car drivers, their destination is within north east London; there is a bias towards destinations fairly close to the Blackwall tunnel, in particular around the Isle of Dogs but also other destinations within Tower Hamlets and Newham.

4.17. In terms of journey origins, a number of these drivers start very close to existing direct links to north east London, including drivers starting close to those sections of the DLR within south east London (on the Woolwich and Lewisham lines).

4.18. Most other drivers start within the south east London boroughs, with high numbers starting from other parts of the boroughs of Greenwich and Bexley, with some further demand originating in Lewisham and Bromley.

4.19. For most of these users, there is access to a large part of the area of north east London by rail and DLR with a single change (at Lewisham, Greenwich or Woolwich Arsenal). Depending on their final destination, there may be a need to change onto a further service elsewhere (e.g. at Canary Wharf or Stratford), but the majority of trips end close to the DLR network.

4.20. There are some areas with car driver origins which do not have such straight-forward access into the area; for example, the capacity of the rail network around Lewisham is such that not all Sidcup or Hayes line trains can call at Lewisham, which results in a less convenient interchange for these lines. Passengers have a choice of an infrequent service, or travelling via a longer route for more frequent services (e.g. via London Bridge).

4.21. This chapter examines further scheme options which have the potential to directly influence drivers currently using the Blackwall tunnel and encourage greater use of public transport to aid congestion. Additional capacity on existing lines has not been specifically assessed, as there is forecast to be available capacity on the relevant cross-river links in the peak. Further enhancements to the bus network have also been discounted at this stage, for the same reason; the bus network is kept under constant review to allow for service changes where there is demand, and enhanced services on this corridor have already been made recently, including the extension of route 132 from Eltham to North Greenwich, broadly along the A102 corridor. It is unlikely however that further changes to the bus network alone would be able to generate a step change in driver behaviour of a scale necessary to address the congestion problems at the Blackwall tunnel.

4.22. The schemes assessed with the potential to drastically encourage a shift from car to public transport are:

- Option B1: Congestion charging at Blackwall
- Option B2: DLR extension to Eltham

4.23. These options are analysed below.

OPTION B1: CONGESTION CHARGING AT BLACKWALL TO MANAGE DEMAND

Option B1 – description

4.24. One option to encourage drivers to switch to public transport, or re-route or re-time journeys away from the busiest periods, and thereby reduce congestion would be to manage the traffic demand through the use of road user charging, or congestion charging. This has successfully reduced traffic demand in central London, and could in theory be applied at the Blackwall Tunnel to reduce the levels of congestion.

4.25. The Mayor's Transport Strategy[2] (MTS) sets out the Mayor's policy on road user charging as follows:

Proposal 130

The Mayor, through TfL, and working with the London boroughs and other stakeholders, if other measures are deemed insufficient to meet the strategy's goals, may consider managing the demand for travel through pricing incentives (such as parking charges or road user charging schemes). This would depend upon there being a reasonable balance between the objectives of any scheme and its costs and other impacts. Any scheme would need to take account of local conditions, as well as the impact on surrounding regions, and to be fair and flexible relating charges to the external costs of travel with sensitivity to time of day, and with scope for discounts or exemptions for specific user groups. The Mayor will also consider imposing charges or tolls to support specific infrastructure improvements, such as river crossings.

4.26. Clearly other measures would need to be considered first; however, should other measures to reduce congestion fail, it may be possible within the policy of the MTS to consider a congestion charge at this location to tackle the problem.

4.27. If such a charge is not being implemented as part of a new infrastructure scheme but purely as a congestion charging measure to encourage drivers to change their travel patterns, to public transport or off-peak periods, it is assumed in this section that a charge would be targeted at peak users. This section assumes therefore that a charge would apply when the Blackwall tunnel is currently over capacity (northbound in the morning, southbound in the afternoon/evening). It is further assumed that the charge applies only at Blackwall, given the legal obligation to provide the Woolwich ferry free of charge. While the Rotherhithe tunnel is relatively nearby, diversion to this crossing from Blackwall in the event of user charging is not likely to be an attractive alternative given the road links between the two crossings on the southern side, and it is therefore assumed that Rotherhithe would not need to be included in a scheme to tackle Blackwall.

[2] http://www.london.gov.uk/publication/mayors-transport-strategy

Option B1 – Assessment against SAF

4.28. The table below summarises the option against the Strategic Assessment Framework.

MTS Challenges	MTS Outcomes	Qualitative Score	Comments
Goal 1: Support economic development and population growth			
Supporting sustainable population and employment growth	Balancing capacity and demand for travel through increasing public transport capacity	Neutral	No additional transport capacity
	Balancing capacity and demand for travel through reducing the need to travel	Slight Positive	Peak charging could discourage peak travel - not enough to eliminate the congestion, but it would reduce it
Improving transport connectivity	Improving people's access to jobs	Slight Positive	Slight improvement to journey times, due to reduced congestion. Offset by the tolling cost
	Improving access to commercial markets for freight movements and business travel	Slight Positive	Slight improvement to journey times, due to reduced congestion. Offset by the tolling cost
Delivering an efficient and effective transport system for goods and people	Smoothing traffic flow (managing delay, improving journey time reliability and resilience)	Slight Positive	Slight improvement to journey time reliability, due to reduced congestion. Offset by the tolling cost
	Improving public transport reliability	Slight Positive	Slight improvement to local bus network journey times and reliability (due to reduced congestion)
	Reducing operating costs	Strong Positive	The scheme would have a start up cost but would quickly recoup the investment and generate revenue
	Bringing and maintaining all assets to a state of good repair	Neutral	No impact
	Enhancing use of the Thames for people and goods	Slight Positive	Better management of existing river crossing facility for road users, local bus services and freight
Goal 2: Quality of Life			
Improving journey experience	Improving public transport customer satisfaction	Slight Positive	Improvement in bus journey times, slight improvement
	Improving road user satisfaction (drivers, pedestrians, cyclists)	Moderate Negative	Tolling would be unpopular, although users would gain a journey time and reliability benefit, the focus would be on the toll
	Reducing public transport crowding	Neutral	Some people might transfer to public transport, but the effect is not expected to be big
Enhancing the built and natural environment	Enhancing streetscape, improving the perception of urban realm and developing 'better streets' initiatives	Neutral	No impact
	Protecting and enhancing the natural environment	Neutral	No impact
Improving air quality	Reducing air pollutant emissions from ground based transport, contributing to EU air quality targets	Slight Positive	Toll on the tunnel would mean some users change to public transport, reducing emissions
Improving noise impacts	Improving perceptions and reducing impacts of noise	Neutral	No impact
Improving health impacts	Facilitating an increase in walking and cycling	Neutral	No impact
Goal 3: Safety and security			
Reducing crime, fear of crime and anti-social behaviour	Reducing crime rates (and improving perceptions of personal safety and security)	Neutral	No impact
Improving road safety	Reducing the numbers of road traffic casualties	Neutral	No impact
Improving public transport safety	Reducing casualties on public transport networks	Neutral	No impact

Goal 4: Transport Opportunities			
Improving accessibility	Improving the physical accessibility of the transport system	Neutral	No impact
	Improving access to services	Neutral	No impact
Supporting regeneration and tackling deprivation	Supporting wider regeneration	Neutral	No impact
Goal 5: Climate change			
Reducing CO_2 emissions	Reducing CO_2 emissions from ground based transport, contributing to a London-wide 60% reduction by 2025	Slight Positive	Toll on the tunnel would mean some users change to public transport, reducing emissions
Adapting for climate change	Maintaining the reliability of transport networks	Slight Positive	Better management of existing river crossing, better resilience
Goal 6: Support delivery of the London 2012 Olympic and Paralympics Games and its legacy			
Developing and implementing a viable and sustainable legacy for the 2012 Games	Supporting regeneration and convergence of social and economic outcomes between the five Olympic boroughs and the rest of London	Slight Negative	Imposes a user cost in east London where there is no cost to users in west London
	Physical transport legacy	Neutral	No impact
	Behavioural transport legacy	Neutral	No impact
Deliverability and Risks		**Option 2**	
		Congestion charging at Blackwall	
Issue	**Assessment Criteria**	**Qualitative Score**	**Comments**
Deliverability and Acceptability Risks	Engineering feasibility risk	Low	Could use same technology as Congestion Charge
	Complexity of delivery (risk)	Low	Relatively easy to install
	Consent risk	Medium	Powers would be required, may be controversial
	Funding risk	Low	Very little capital required, and would immediately generate revenue
	Stakeholder acceptability risk	High	
	Public acceptability risk	High	
	Overall deliverability risk	High	Politically difficult
Complexity of operation	Operational feasibility risk	Low	
Value for Money	Benefit Cost Ratio	> 4	Not quantified but assume high
Affordability and Financial Sustainability	CAPEX	< £5m	Low cost to install
	OPEX per annum	£2m < £5m	Contract cost to manage the system
	Revenue implications per annum	£10m < £50m	Depends on tolling regime
	Funding potential within TfL budget	High	Would generate revenue so could find initial funding
	Funding potential with private finance, e.g. via S106, securitisation of revenue, and DfT	Low	
Timescales	Timescale for delivering the changes	Short-term	
	Program risk	High	Due to opposition

Option B1 – Assessment against programme objectives

Option B1 – improving the efficiency of the highway network

Peak congestion

4.29. TfL has tested the concept of user charging Blackwall, and found that a reduction in demand could be achieved through charging users. However given the very high mismatch of demand to capacity, charges would need to be very significant in the peak direction (northbound in the morning, southbound in the evening) to bring demand down to a level which eliminates or substantially reduces congestion, given the lack of alternative routes available to users who do not wish to pay.

4.30. Tests in TfL's highway models suggest that tolls levied at levels similar to the Dartford Crossing have only small effects on demand at the Blackwall tunnel in the peak direction, given that the demand is approximately 150% of the capacity; drivers are spending around 20 minutes in the queue at peak times and therefore a modest toll does not have a major deterrent effect, and any displaced traffic in the peak will be replaced by other traffic from the queue.

4.31. Queues would not be eliminated, but user charging would shorten the length of delays, and the length of time for which the tunnel is at capacity; this would provide congestion benefits and would save users time.

4.32. However charges sufficient to reduce demand from around 150% of capacity to a level within capacity would be punitive and are unlikely to be politically feasible.

4.33. The high level of excess demand and the effect this has had on peak-spreading (i.e. the delays in the peak have caused users to re-time their journeys to avoid the height of the peak) make it difficult to make accurate predictions of the effects without more detailed work on local driver attitudes to user charging.

4.34. In the non-peak direction, while the tunnel suffers from some delays at the height of the peak, there is generally spare capacity over the peak period as a whole, and therefore the models are better able to assess the effect of tolls on demand. The models suggest that in the counter-peak direction, tolls could substantially reduce demand, because the cost of the delay is likely to be lower for many users than the cost of the toll, if set at Dartford levels. Using the future Dartford levels of £2.50 for cars (and higher for goods vehicles), the models suggest that demand could drop by around half.

4.35. This suggests that if a toll is targeted at current congestion, and not associated with new capacity or connectivity, it should be targeted at traffic travelling in the peak direction.

Crossing resilience and network reliability

4.36. Charging would have some benefits in terms of reliability and resilience by reducing overall demand, and therefore the likelihood of incidents occurring, and volume of traffic diverting when incidents do occur. However it could not eliminate incidents, only reduce their occurrence slightly, and it would provide no alternative crossing option in the event of Blackwall closing for planned or unplanned closures.

Journey times

4.37. Introducing a congestion charge at the Blackwall tunnel would not increase capacity, although it may lead to a more efficient use of it, if traffic is encouraged to cross at quieter times.

4.38. Journey times would reduce, not through new connectivity but reduced congestion, with effects dependent on the levels of charge and how it is imposed (what times, what discounts/exemptions applied etc.).

4.39. A peak period, peak direction charge is unlikely to completely eradicate queues altogether, unless set at a level which is likely to be difficult to justify politically, but any charge is likely to have a beneficial effect on journey times at peak periods, with just a small reduction in demand resulting in benefits to those remaining in the queue. It is also likely to reduce the length of time in which delays are encountered, provided that the charges apply for the whole of the period during which the tunnel is currently over capacity.

Option B1 – supporting the public transport network

4.40. This option would not increase public transport opportunities directly; however, the scheme would be likely to produce a revenue surplus which would be available for local transport improvements. While this could include measures to directly aid the road users, it could also be used to enhance public transport alternatives, such as increasing cross-river bus service provision to make it easier for drivers to switch mode.

Option B1 – integrating with land use policies

4.41. Reduced delays would be beneficial to local residents and businesses, but this could be offset by higher costs imposed on them by the introduction of user charging. With no new capacity or connectivity any positive regeneration effects are likely to be very minor.

Option B1 – impacts on health, safety and the environment

4.42. A reduction in traffic demand and queuing at peak times would have a beneficial impact on local air quality and thereby this option would have a modest overall positive environmental impact.

4.43. With charges also applied to goods vehicles, there may be a reduction in overheight vehicle incidents, which would bring modest safety benefits.

Option B1 – borough and other stakeholder views

4.44. While drivers in the peak direction would gain the benefit of reduced congestion, there would be no new infrastructure to show from the user charging. Without the provision of new physical infrastructure, there would remain a significant problem of resilience, as the issues of ageing infrastructure at Blackwall and poor alternative routes would remain. It is likely therefore to be opposed by interested stakeholders.

Option B1 – achieving value for money

4.45. The scheme would have some set-up costs, but this would be recouped rapidly from user charges and deliver a surplus. The extent of this would depend on the level of charges and time periods/directions charged, with all day user charging delivering much more revenue than a charge targeting the peak, but would be far less acceptable to users.

4.46. There would be limited effects on the wider economy, as the issues of highway network resilience would not be greatly improved.

Option B1 – Programme objective summary

4.47. The table below summarises the option of user charging the Blackwall tunnel against the programme objectives.

		B1. Toll Blackwall
To improve the efficiency of the highway network in the London Thames Gateway, especially at river crossings, and provide greater resilience for all transport users	Peak Blackwall congestion	Slight Positive
	Blackwall crossing resilience	Slight Positive
	Connectivity east of Greenwich	NA
	Approach road independence	Neutral
	Local road reliability (Greenwich)	Slight Positive
	Local road reliability (Woolwich)	Slight Negative
To support the needs of existing businesses in the area and to encourage new business investment	Local road reliability (Bexley)	Neutral
	Local road reliability (Royal Docks)	Neutral
	JTs across sub-region (peak)	Slight Positive
	JTs across sub-region (off-peak)	Neutral
To support the provision of public transport services in the London Thames Gateway	Reliability of local buses	Slight Positive
	Allows new orbital public transport	Neutral
	Mode shift potential, car to public	Slight Positive
To integrate with local and strategic land use policies	Lower Lea Valley OA	Neutral
	Greenwich Peninsula OA	Neutral
	Royal Docks OA	Neutral
	London Riverside OA	Neutral
	Bexley Riverside OA	Neutral
	Thamesmead & Abbey Wood OA	Neutral
	Woolwich OA	Neutral
	Charlton Riverside OA	Neutral
To minimise the impacts of any proposals on health, safety and the environment	Health	Neutral
	Safety	Slight Positive
	Environment	Slight Positive
To ensure where possible that any proposals are acceptable in principle to key stakeholders, including affected boroughs	Local boroughs	Slight Negative
	Other stakeholders	Slight Negative
To achieve value for money	Business case	Strong Positive
	Wider economic benefits	Neutral
	Low cost for users	Slight Negative
	CIL funding potential	Neutral
	Potential for user revenue to offset	Strong Positive
	Capital cost	Slight Positive

Assessment of Option B1 (Tolling) – conclusion

4.48. Under Option B1, the Blackwall tunnel continues to function as it does currently but would be tolled.

4.49. This option has been assessed against the MTS goals and outcomes using SAF and the specific programme objectives.

Goal 1 – support economic development and population growth

4.50. The option performs positively against this goal, as it would reduce congestion and improve journey times at the Blackwall tunnel.

Goal 2 – quality of life

4.51. The option performs neutrally overall against this goal, with slightly improved public transport user satisfaction if bus services benefit from reduced congestion, but greater dissatisfaction among road users impacted by additional costs.

Goal 3 – safety and security

4.52. The option performs neutrally overall against this goal.

Goal 4 – transport opportunities

4.53. The option performs neutrally overall against this goal.

Goal 5 – climate change

4.54. The option performs positively overall against this goal, by encouraging some road users to switch to public transport or travel at less congested (uncharged) times.

Goal 6 – support delivery of the London 2012 Olympic and Paralympic Games and its legacy

4.55. The option performs slightly negatively overall against this goal, with additional costs imposed on road users without any compensating new infrastructure.

Programme objectives

4.56. User charging would support economic development and population growth. It could have a beneficial impact on levels of congestion at the Blackwall tunnel at peak times; financially the scheme would perform well, as the scheme would be very low cost and would return positive revenues even if charging were restricted to peak periods.

4.57. However, it would have little effect on some other objectives, including resilience and connectivity, and would impose costs on local people and businesses without delivering any new infrastructure.

4.58. The Mayor's policy on road user charging is clear. Proposal 130 of the MTS states that *"The Mayor, through TfL, and working with the London boroughs and other stakeholders, if other measures are deemed insufficient to meet the strategy's goals, may consider managing the demand for travel through pricing incentives (such as parking charges or road user charging schemes). This would depend upon there being a reasonable balance between the objectives of any scheme and its costs and other impacts. Any scheme would need to take account of local conditions, as well as the impact on surrounding regions, and to be fair and flexible relating charges to the external costs of travel with sensitivity to time of day, and with scope for discounts or exemptions for specific user groups. The Mayor will also consider imposing charges or tolls to support specific infrastructure improvements, such as river crossings."*

4.59. The Mayor's policy on the imposition of road user charges is clear that they will be considered only if other measures are insufficient, or to support specific infrastructure improvements. In this case, options for new crossings are available, and therefore cannot at this stage be said to be insufficient to address the congestion challenge at Blackwall. And without a new crossing being built to provide the enhanced infrastructure, user charging in isolation would not meet the criterion related to new infrastructure.

4.60. Given the analysis above and the Mayor's policy on road user charging **it is not recommended that user charging is pursued as a means of reducing congestion in isolation**; however, it could prove effective in conjunction with new infrastructure which delivers improved road network resilience, or could be reconsidered as an independent option for reducing peak demand in the event that proposed new crossings are not taken forward.

OPTION B2: DLR EXTENSION TO FALCONWOOD

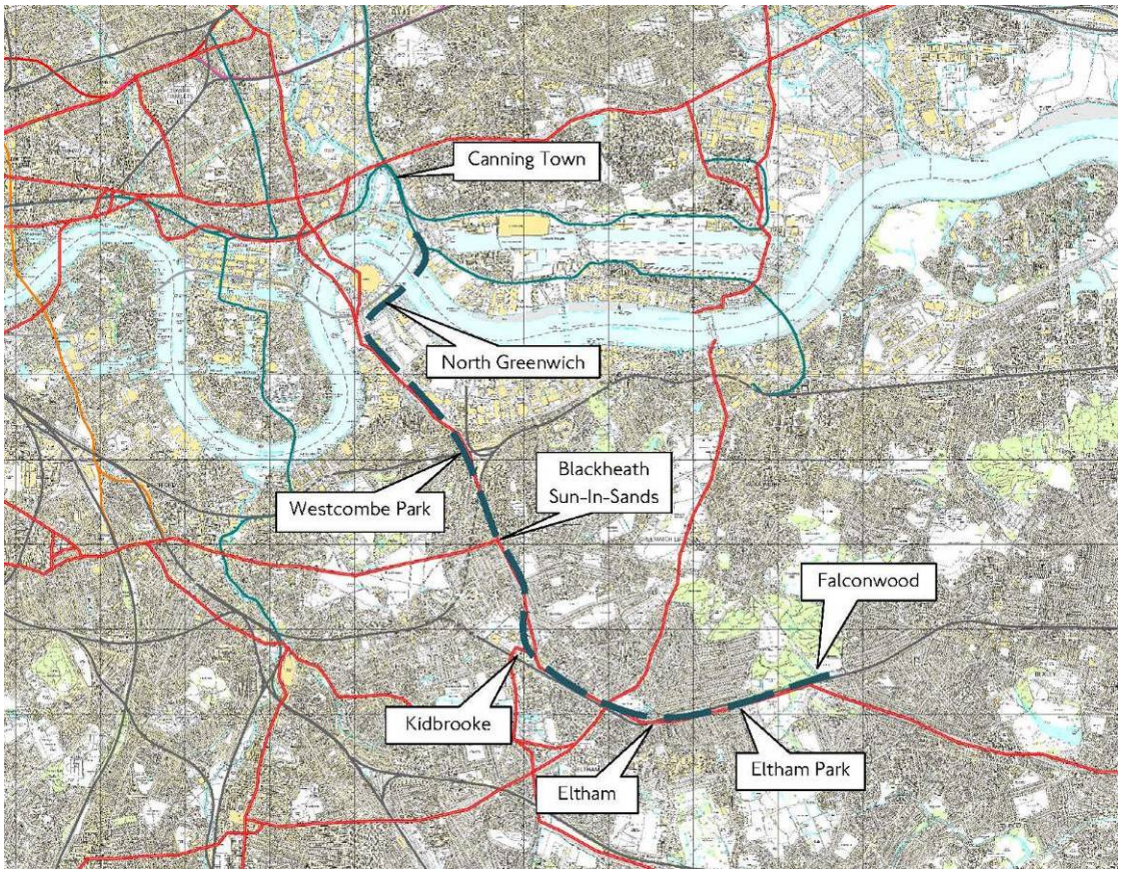
Option B2 – Option description

4.61. The Royal Borough of Greenwich has been seeking improved north-south links through the borough to provide better connections to North Greenwich and Docklands from the Eltham and Kidbrooke areas, and has identified a potential extension of the DLR from Canning Town to Falconwood as a preferred scheme. This would follow the Blackwall Tunnel approach road and cross the Thames to Docklands, so would have the potential to appeal to Blackwall tunnel users.

4.62. The concept is a new branch off the current "Airport route" (Woolwich Arsenal branch) south of Canning Town, crossing the Thames in tunnel to the Greenwich Peninsula (independently or as part of the Silvertown road tunnel), then following the A102 then A2 via Kidbrooke to Eltham, and finally Falconwood, at the boundary with the London Borough of Bexley.

4.63. The concept is illustrated in the plan below.

Figure 3.4 - Plan of the concept extension of the DLR to Eltham



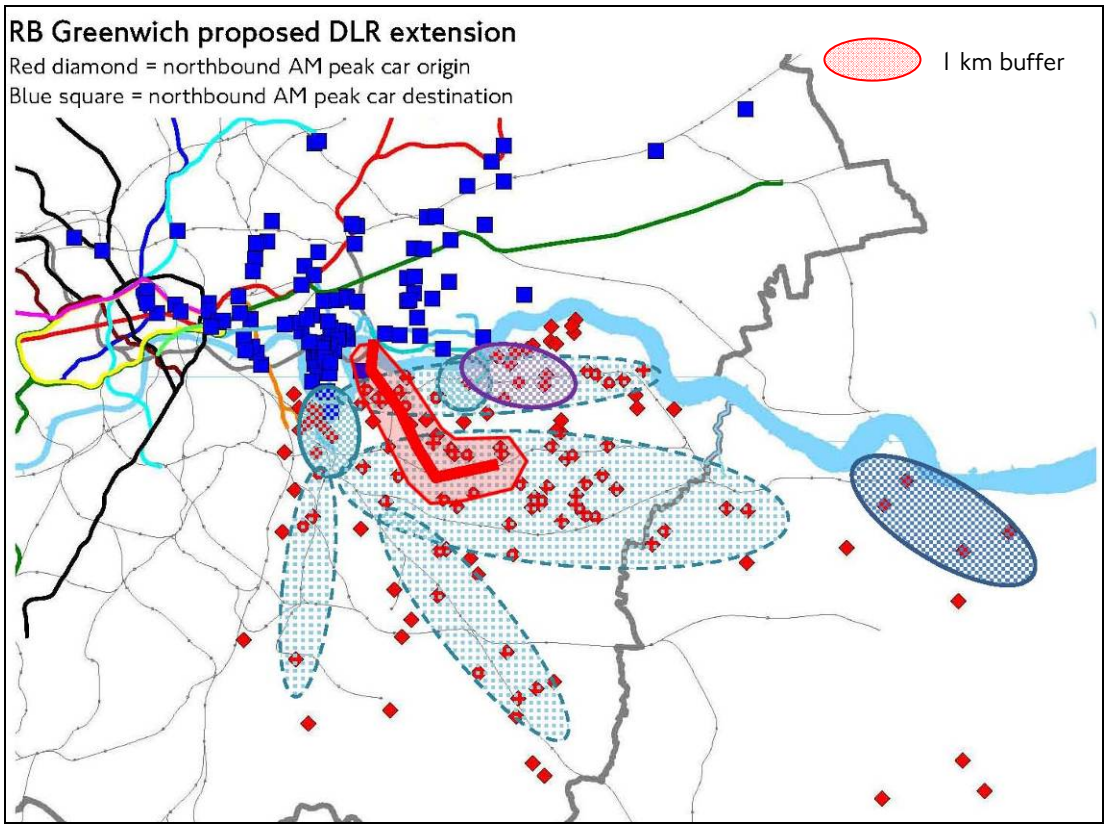
4.64. The route is summarised in the table below.

Section	Description	Comments
Junction south of Canning	The DLR "Airport route" would be split, with one part of the service continuing to Woolwich Arsenal as today and another part of the service running towards Eltham.	DLR advise that the addition of a further branch would be very problematic, in adding complexity to the network around Canning Town, which is a major network hub. It may be necessary for a new pair of tracks from Canning Town to the new junction, which may need to be grade separated. In addition, the Airport route is a very busy part of the network, with significant peak demand from Woolwich Arsenal and intermediate stations, as well as heavy peak demand originating at City Airport. The DLR is concerned that it would not be able to service the demand on the existing Airport route if some trains are diverted towards Eltham.
Descent to the cross-river tunnel	The new branch would descend from the elevated section to the Silvertown Tunnel.	The carriageway of the Silvertown Tunnel descends from ground level in the vicinity of the Tidal Basin Roundabout at a gradient of 4%. The DLR is elevated to pass over Scarab Close; incorporating a DLR line into the Silvertown tunnel would require the DLR to drop significantly and may not be achievable while maintaining headroom at Scarab Close.
Silvertown tunnel	The DLR would be incorporated into the Silvertown Tunnel, either above or below the carriageway in a bored tunnel, or potentially alongside in an immersed tube.	A shared tunnel would pose a number of issues around horizontal and vertical alignment, fire / smoke risks, operational protocols etc. However, shared road/rail tunnels have been built elsewhere and it is likely to be feasible to accommodate a DLR at a cost. How much additional cost cannot be determined without a detailed engineering assessment, but it would increase the size of any tunnel significantly, and would impose additional alignment constraints. The route would be directly parallel to the Jubilee line between North Greenwich and Canning Town.
Greenwich peninsula	A station would be provided on the Greenwich Peninsula. It is not clear how this could be configured, as it would depend on the tunnel construction type. However the alignment constraints are such that the station would be located on Edmond Halley Way, and would be below ground.	A station would be around 200 metres from North Greenwich Underground station. It would be sub-surface and would therefore be a "Section 12" station, which comes with stringent safety standards due to the higher risks in a below-ground station, e.g. it would need to be fully staffed.
Greenwich peninsula to Eltham	The concept is for a DLR line to follow the existing alignment of the A102 and A2 from the Greenwich peninsula to Kidbrooke, where it would serve the Kidbrooke growth area. The line is assumed to be elevated above the highway.	The median along the A102 and A2 is not generally sufficiently wide for structural columns to support a DLR line and would need to be widened. In parts this is possible through narrowing parts of the carriageway, e.g. hard shoulders, but in sections this does not appear to be feasible (e.g. where no hard shoulder is present). At Woolwich Road the A102 passes over the more local A206. It is likely that the flyover would need to be reconstructed to accommodate a DLR above. At several other roads, the local road passes above the A102; how the conflict with these routes would be resolved would need detailed work.

Section	Description	Comments
Eltham tunnel	Eltham station interchange	At Eltham station, the A2 passes below Eltham station and bus station, which are decked over the A2 and create a tunnel. It is unclear how the DLR could pass this point without demolition and reconstruction of the tunnel.
Eltham to Falconwood	Route along A2.	For some of this section the route could pass above the A2 (subject to removing the hard shoulder) although there are problems with the bridges carrying roads over the A2.

4.65. The plan below shows the route of the borough's concept extension against the plot of existing cross-river public transport connections and morning peak car users' origins and destinations, taken from TfL's most recent roadside interview survey at the Blackwall tunnel.

Figure 3.5 - Blackwall car drivers and RB Greenwich's concept DLR extension



4.66. The route has some overlap with areas currently only one change from the DLR (as all the trains through the Eltham line pass through Lewisham), but it does fill some gaps in the existing network. It would provide a direct link to north east London from areas which are currently less well served by the rail network, including those parts of Blackheath/Charlton around the Sun-In-Sands junction which are a little distant from a national rail station.

4.67. As this would provide more direct journeys across the Thames from some of the areas from which car drivers originate, this DLR extension concept has been reviewed to determine if it could alleviate congestion at the Blackwall tunnel.

Option B2 – Assessment against SAF

4.68. The table below summarises the option against the Strategic Assessment Framework.

MTS Challenges	MTS Outcomes	Qualitative Score	Comments
Goal 1: Support economic development and population growth			
Supporting sustainable population and employment growth	Balancing capacity and demand for travel through increasing public transport capacity	Neutral	It would provide additional public transport capacity but it would only be a viable alternative for a maximum of 4% of existing tunnel users. If this happened Blackwall would go from operating at 151% of capacity to 147% capacity. So very small impact. Also it would limit future increases in capacity on the Beckton branch of the DLR and potential extension to Dagenham Dock
	Balancing capacity and demand for travel through reducing the need to travel	Neutral	No impact on the need to travel
Improving transport connectivity	Improving people's access to jobs	Slight Positive	Would provide a new PT link from Falconwood, Eltham etc to North Greenwich where passengers can change to get to Canary Wharf
	Improving access to commercial markets for freight movements and business travel	Neutral	Expect a very low % of modal shift from road to DLR, so congestion in Blackwall tunnel would remain the same
Delivering an efficient and effective transport system for goods and people	Smoothing traffic flow (managing delay, improving journey time reliability and resilience)	Neutral	Expect a very low % of modal shift from road to DLR, so congestion (and journey time reilability) in Blackwall tunnel would remain the same
	Improving public transport reliability	Slight Positive	Another PT link in SE London, would increase resilience on the network
	Reducing operating costs	Neutral	Further work would be required to establish this, but this is not proposed as this option does not meet the scheme objectives
	Bringing and maintaining all assets to a state of good repair	Neutral	No impact
	Enhancing use of the Thames for people and goods	Neutral	No impact, no impact on freight
Goal 2: Quality of Life			
Improving journey experience	Improving public transport customer satisfaction	Slight Positive	Increase in PT provision would create customer satisfaction (although may cause other customers to be less satisfied if this limits capacity increases elsewhere)
	Improving road user satisfaction (drivers, pedestrians, cyclists)	Neutral	No impact
	Reducing public transport crowding	Moderate Negative	Fastest journey time to key location (Canary Wharf) is via change to Jubilee line at North Greenwich, this section is already crowded and would get worse
Enhancing the built and natural environment	Enhancing streetscape, improving the perception of urban realm and developing 'better streets' initiatives	Neutral	No impact
	Protecting and enhancing the natural environment	Neutral	No impact
Improving air quality	Reducing air pollutant emissions from ground based transport, contributing to EU air quality targets	Neutral	Expect a very low % of modal shift from road to DLR, so emissions would remain at a similar level
Improving noise impacts	Improving perceptions and reducing impacts of noise	Neutral	No impact - DLR extension would be built along existing road links that are already noisy
Improving health impacts	Facilitating an increase in walking and cycling	Neutral	No impact
Goal 3: Safety and security			
Reducing crime, fear of crime and anti-social behaviour	Reducing crime rates (and improving perceptions of personal safety and security)	Neutral	No impact
Improving road safety	Reducing the numbers of road traffic casualties	Neutral	No impact
Improving public transport safety	Reducing casualties on public transport networks	Neutral	No impact

Goal 4: Transport Opportunities			
Improving accessibility	Improving the physical accessibility of the transport system	Slight Positive	Extension of a fully accessible public transport mode
	Improving access to services	Slight Positive	New cross river link catering for trips to local services
Supporting regeneration and tackling deprivation	Supporting wider regeneration	Slight Positive	Additional public transport connectivity to a growth area
Goal 5: Climate change			
Reducing CO_2 emissions	Reducing CO_2 emissions from ground based transport, contributing to a London-wide 60% reduction by 2025	Neutral	Expect a very low % of modal shift from road to DLR, so emissions would remain at a similar level
Adapting for climate change	Maintaining the reliability of transport networks	Slight Positive	Improves resilience as provides an alternative link to the existing National Rail / DLR links via Lewisham, but no impact on road network resilience
Goal 6: Support delivery of the London 2012 Olympic and Paralympics Games and its legacy			
Developing and implementing a viable and sustainable legacy for the 2012 Games	Supporting regeneration and convergence of social and economic outcomes between the five Olympic boroughs and the rest of London	Neutral	No impact
	Physical transport legacy	Neutral	No impact
	Behavioural transport legacy	Neutral	No impact

Deliverability and Risks		**Option 3**	
		DLR extension to Falconwood	
Issue	**Assessment Criteria**		
Deliverability and Acceptability Risks	Engineering feasibility risk	High	Difficultly in connecting with the railway junction at Canning Town
	Complexity of delivery (risk)	High	Extension through built up area including river crossing and alongside main roads
	Consent risk	Medium	Powers would be required
	Funding risk	High	No funding secured
	Stakeholder acceptability risk	Medium	RB Greenwich support, DLR have operational concerns
	Public acceptability risk	Low	
	Overall deliverability risk	High	
Complexity of operation	Operational feasibility risk	Medium	Interacts with existing operations at Canning Town, could make it more complex
Value for Money	Benefit Cost Ratio	Unknown	Not quantified
Affordability and Financial Sustainability	CAPEX	£500m <£1bn	Expect high captial cost in line with other DLR extensions
	OPEX per annum	£5m < £10m	Estimate for DLR extension to Dagenham Dock is £4.5m / year. This extension would be longer and has more stations
	Revenue implications per annum	£1m < £2m	No modelling undertaken, expect many users would switch from other PT routes, so low additional revenues
	Funding potential within TfL budget	Low	No funding available
	Funding potential with private finance, e.g. via S106, securitisation of revenue, and DfT	Low	Does not generate / facilitate any new development
Timescales	Timescale for delivering the changes	Long-term	Long term project
	Program risk	Medium	Could be issues though DLR are reliable

Option B2 – Assessment against programme objectives

Option B2 – improving the efficiency of the highway network

Peak congestion

4.69. The effect of this option depends upon its success in attracting car drivers to switch to public transport, as it is assumed not to alter the highway network. Its attractiveness as a route for existing car drivers is discussed in more detail below; in short, such an extension, while potentially having merits in its own right as a public transport scheme, is unlikely to make significant inroads into the existing traffic at the Blackwall tunnel and is not likely to have a notable effect on peak congestion.

Crossing resilience and network reliability

4.70. The scheme is unlikely to have any notable effect on road network resilience or reliability.

Journey times

4.71. The scheme is unlikely to have any notable effect on road network journey times (although it could for some public transport users – see below).

Option B2 – supporting the public transport network

4.72. A DLR extension south from Canning Town could have varying levels of capacity depending on the demand; the length of train can be varied (2 or 3 car) and alternative levels of frequency could be provided. If it is assumed that the capacity would be similar to the Woolwich Arsenal extension, it could carry around 7,500 passengers per hour.

4.73. The scheme would reduce journey times for some users. A series of sample journey pairs have been considered and journey time estimated with and without the DLR extension. It is assumed that the scheme would be as proposed by the Royal Borough of Greenwich and that it would have a frequency of 10 trains per hour. Note that this level of frequency could have some impacts on the frequency available to other parts of the DLR but longer journey times on other branches as a result have not been considered at this stage.

4.74. The Table below shows an estimate of average journey times without the DLR on the left, and with the DLR extension on the right, with the final column showing the difference in time with the DLR extension in place.

Actual time (mins)	**existing**	**with DLR**	*Difference*
Route 1 - North Greenwich to Stratford	14.7	19.7	**5.0**
Route 2 - Blackheath Royal Standard to Stratford	43.2	27.4	**-15.8**
Route 3 - Blackheath Royal Standard to Canary Wharf	37.8	27.7	**-10.1**
Route 4 - Kidbrooke to Canary Wharf	32.2	29.4	**-2.8**

Route 5 - Eltham High St to Canary Wharf	40.2	37.3	**-2.9**
Route 6 - Falconwood to Canary Wharf	37.7	35.8	**-1.9**
Route 7 - Eltham Station to Stratford	50.1	37.1	**-13.0**

4.75. The analysis allows some conclusions to be drawn:

(i) From North Greenwich to points north of the Thames, the DLR would be slower than the existing (London Underground) service; journey time benefits are being derived south of the Thames rather than by the cross-river link itself;

(ii) Journeys from SE London to Canary Wharf via the new link are fastest via a change onto the Jubilee line, either at North Greenwich (where there would be an inconvenient walk) or at Canning Town (more convenient, but requiring passengers to double-back on themselves);

(iii) Benefits from areas already within the catchment of a railway station are small for the major destinations such as Canary Wharf (and central London trips would not be affected); however the benefits are much greater where the link would provide a rail service for the first time, such as the Royal Standard area of Blackheath;

(iv) With much higher demand towards Canary Wharf and central London, there is likely to be a high level of interchange at North Greenwich; if this is the case, the actual river crossing section, very expensive to build, would carry a relatively low number of passengers.

4.76. The journeys with the highest levels of demand are likely to remain into major hubs such as Canary Wharf; for most passengers, the new line would offer a journey time benefit and would thus be attractive (as well as improving resilience by offering an additional route), but the benefits are small.

4.77. These actual time benefits must also be considered against the weighted journey time; in particular, at peak times, journey ambience can be heavily affected by crowding on the network, and passengers will tend to choose a slightly slower route if the journey is more comfortable.

4.78. The Figures below show the forecast levels of crowding on National Rail, LU and DLR services in 2031 in the 'Reference case', that is with the network enhancements to take account of committed changes such as Crossrail and Network Rail capacity schemes, but without any changes to the transport network beyond schemes already committed.

Figure 3.6 - National Rail crowding in 2031, Reference case

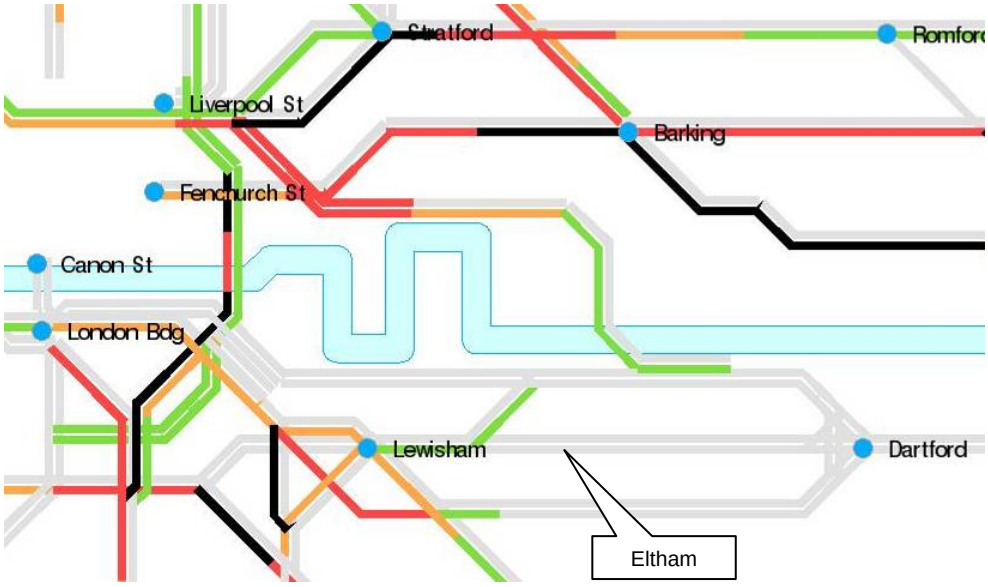
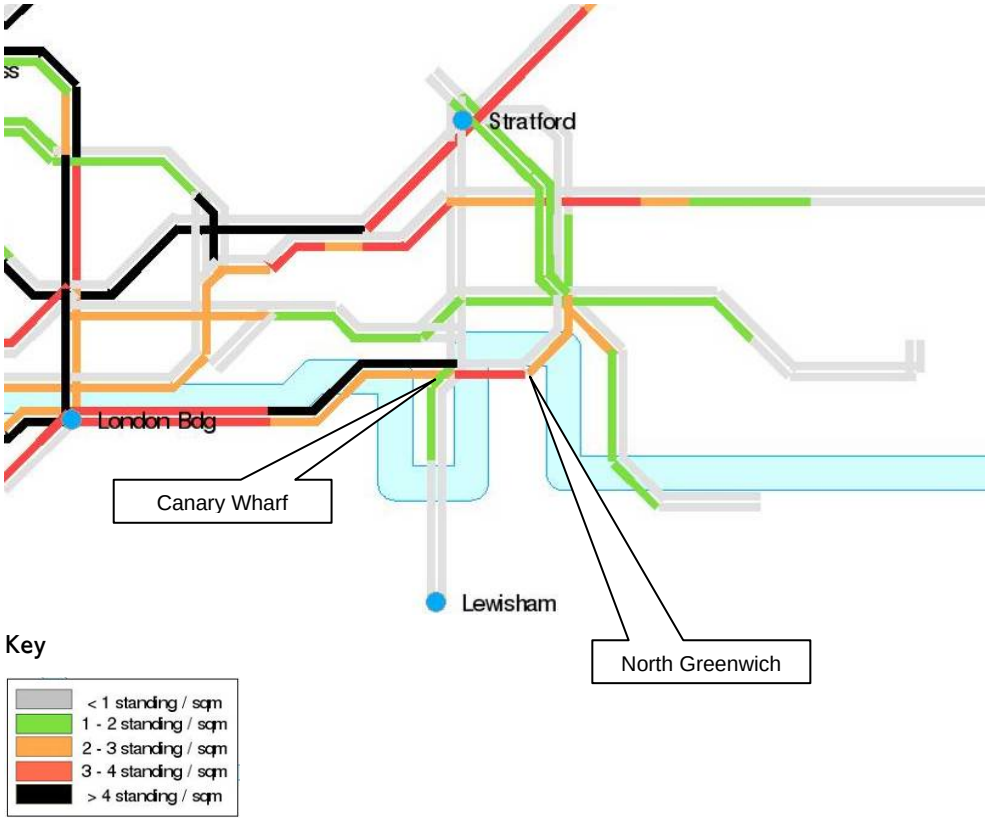


Figure 3.7 – LU and DLR crowding in 2031, Reference case



Note: Directions are presented on a 'drive on the left' principle; e.g. on a north-south line, the left hand line represents northbound crowding.

4.79. The graphs show that there is forecast to be spare capacity on the National Rail lines into Lewisham in 2031 (which is following the reconstruction of London Bridge and new Southeastern service pattern), and also on the DLR Lewisham branch into Canary Wharf from the south. In contrast, the Jubilee line into Canary Wharf is heavily

loaded, with the section from North Greenwich to Canary Wharf forecast to have 3-4 standing passengers per m^2.

4.80. These figures suggest:

(i) any actual time savings of the new route are likely to be offset by crowded conditions, meaning that passengers for Canary Wharf may well choose to use the existing option rather than switch to the new option, which requires them to board a crowded LU service at North Greenwich;

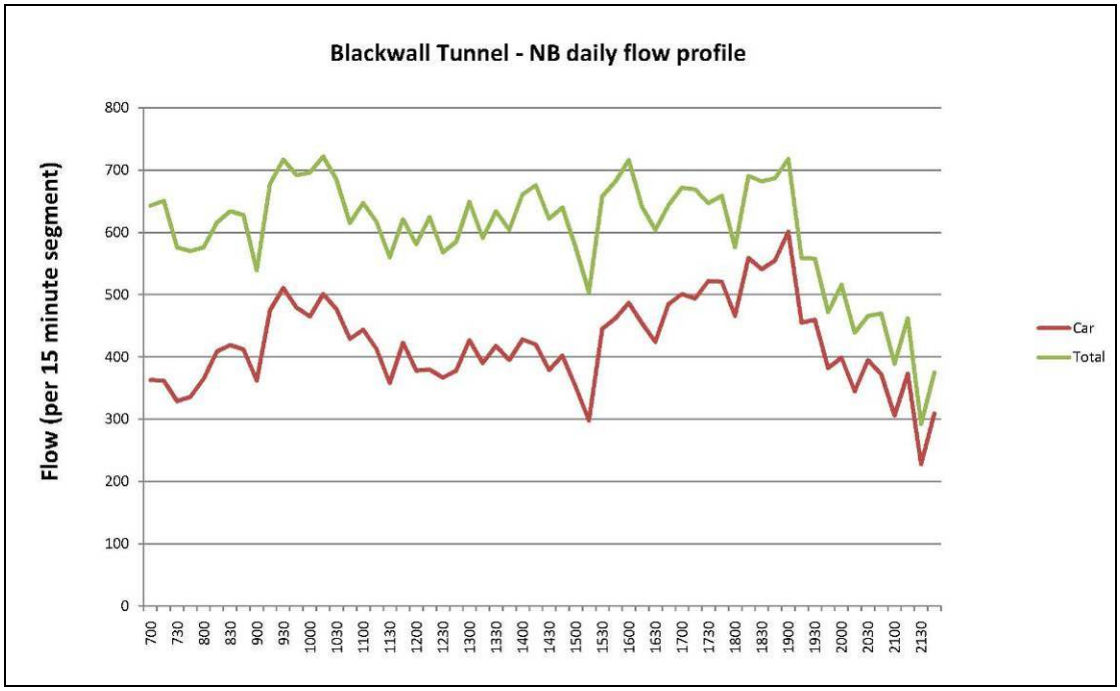
(ii) if passengers do use such a DLR extension to access Canary Wharf (e.g. those who are more remote from a National Rail station), they will worsen the crowding on what is already a very crowded section of line, which would be undesirable.

Modal shift potential

4.81. The origin / destination data from the Blackwall tunnel roadside interview surveys has been interrogated to analyse the potential impact on traffic demand at the Blackwall tunnel.

4.82. It is assumed that goods vehicle trips are highly unlikely to switch mode in response to a change in public transport accessibility, and therefore this analysis focuses on car traffic. The graph below illustrates the proportion of the total flow which is made up by car traffic compared with the total number of vehicles.

Figure 3.8 – LU and DLR crowding in 2031, Reference case



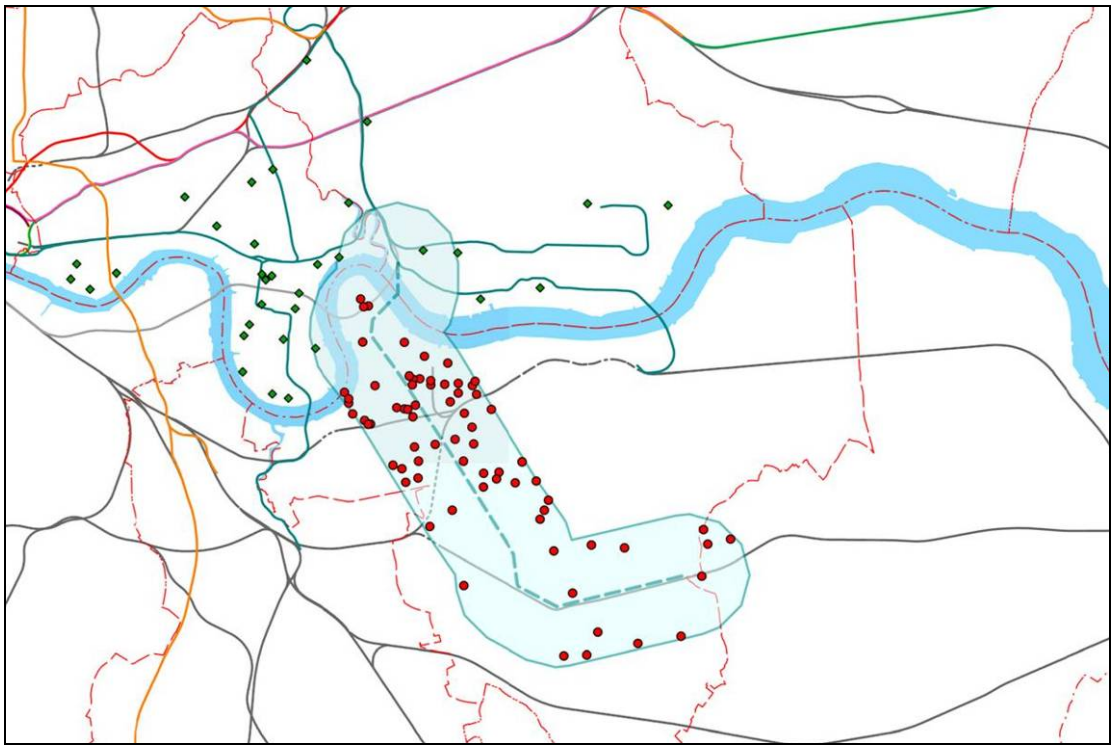
4.83. The graphs shows that in the morning peak period, car flows are typically around 400-500 per 15 minute period, out of a total of 600-700 vehicles in total; other classes of vehicle make up around a third of the inbound trips in the morning peak.

4.84. Of these, a number have an origin which could potentially be served by a DLR extension to Eltham. An area around this route of 1 km has been identified, which represents an approximate walking catchment to the line, and the car trips originating

in this area analysed. In total, 104 of the surveyed car drivers had an origin within this area, which represents 15% of the sample of car traffic using the Blackwall tunnel. (Analysis of the morning peak data suggests a slightly lower percentage, although the sample size is smaller and so the all-day data has been used.)

4.85. Of these, 39 had a destination within the area served by the DLR (Docklands, Bow and Stratford); these users represent 5.6% of the sample (see the Figure below; note, some points represent multiple trips, e.g. trips to/from the same postcode or car park).

Figure 3.9 - All day car origins within proximity of the DLR extension and destinations close to the existing DLR



4.86. The data thus suggests that a DLR extension could provide an attractive new cross-river link for up to 5.6% of the car drivers using the Blackwall tunnel, or around 4% of the overall traffic (when goods vehicles are taken into account).

4.87. Of the 4% of tunnel users who would have a new option of using the DLR, it is unlikely that a high proportion of these drivers would find it convenient to switch to the DLR; most already have a reasonable public transport alternative, although it may require a change en route. Figure 3.5 suggests that motorists from areas close to the existing DLR lines in south east London still find it convenient to drive despite the congestion, and that the choice of car is being made for other considerations, which could for example include a need to use a car during the day, to travel at unsociable hours, to carry tools, goods or equipment, or for personal health reasons.

4.88. Currently the Blackwall tunnel carries around 3,300 PCUs per hour northbound during the peak. TfL's traffic models suggest that the demand is closer to 5,000 PCUs per hour (the excess demand being held in the queue on the approach to the tunnel). The tunnel demand is thus about 150% of its capacity in the peak.

4.89. Even on a highly optimistic simple assumption that all drivers within an origin within 1 km of a DLR extension would switch from driving to using the new line, a reduction in demand of 4% would leave the Blackwall tunnel operating at around 146% of capacity, rather than 150%. While this would have benefit, even this level of modal change would not materially reduce congestion at the Blackwall tunnel.

Option B2 – integrating with land use policies

4.90. The extension would reduce journey times for its users, and therefore would have a positive effect on the opportunities for employment from the areas served. However, the gains are relatively modest, in that the extension would not directly serve Canary Wharf, the major centre of employment in the area.

4.91. The extension is unlikely to stimulate any significant new development. The main area of brownfield land served is the Greenwich peninsula, which already has direct links to Canary Wharf, Lower Lea Valley and Stratford via the Jubilee line. The DLR is therefore not likely to materially influence the extent of development.

4.92. The extension would serve Kidbrooke, but this development is already well under way and the presence of the DLR is unlikely to affect the scale of development, although it would increase its attractiveness. Blackheath, Eltham and Falconwood are established residential areas.

4.93. However, in taking some DLR train paths from the lines serving the Royal Docks, it would reduce the scope in the future to fully utilise all the existing capacity on the current lines, in particular the line to Woolwich and the line to Beckton (which could potentially also carry trains to Dagenham Dock).

4.94. The scheme could therefore weaken the potential in the future to improve services to these other Opportunity Areas.

Option B2 – impacts on health, safety and the environment

4.95. The scheme would have minor impacts upon health and environment. The environmental benefits gained by improving the attractiveness of public transport relative to car use would be offset by the negative impacts associated with construction.

Option B2 – borough and other stakeholder views

4.96. The idea of such an extension has been led by the Royal Borough of Greenwich, and it is likely to have the support of other local boroughs provided it did not result in the loss of another DLR extension (e.g. the potential extension to Dagenham Dock, if this took the DLR train paths planned to be used for that extension).

Option B2 – achieving value for money

4.97. Given the likely very limited impact of the scheme on the Blackwall tunnel, no engineering assessments have been undertaken to provide a basis for costing the scheme. For a line of this length, the capital cost is likely to be in the range of £500 million to £1 billion, and could even be higher. A factor to be considered is whether the line would be built in isolation or in conjunction with another tunnel, such as the Silvertown road tunnel discussed later. However, the extent of design change required to provide for rail use through the tunnel means that any cost savings from a multi-modal scheme are likely to be small.

4.98. It is not possible on the evidence available to make an assessment of the business case in the round, including passenger time savings and crowding benefits/disbenefits (important factors in the assessment of public transport schemes); however it is fairly clear that *as an option for addressing the highway problems* the option would not offer value for money.

Option B2 – Programme objective summary

4.99. The table below summarises the option of investing in a DLR extension against the programme objectives.

		B2. DLR to Eltham
To improve the efficiency of the highway network in the London Thames Gateway, especially at river crossings, and provide greater resilience for all transport users	Peak Blackwall congestion	Neutral
	Blackwall crossing resilience	Neutral
	Connectivity east of Greenwich	NA
	Approach road independence	Neutral
	Local road reliability (Greenwich)	Neutral
	Local road reliability (Woolwich)	Neutral
To support the needs of existing businesses in the area and to encourage new business investment	Local road reliability (Bexley)	Neutral
	Local road reliability (Royal Docks)	Neutral
	JTs across sub-region (peak)	Neutral
	JTs across sub-region (off-peak)	Neutral
To support the provision of public transport services in the London Thames Gateway	Reliability of local buses	Neutral
	Allows new orbital public transport	Moderate Positive
	Mode shift potential, car to public	Slight Positive
To integrate with local and strategic land use policies	Lower Lea Valley OA	Slight Positive
	Greenwich Peninsula OA	Slight Positive
	Royal Docks OA	Neutral
	London Riverside OA	Neutral
	Bexley Riverside OA	Neutral
	Thamesmead & Abbey Wood OA	Neutral
	Woolwich OA	Neutral
	Charlton Riverside OA	Neutral
To minimise the impacts of any proposals on health, safety and the environment	Health	Neutral
	Safety	Slight Negative
	Environment	Neutral
To ensure where possible that any proposals are acceptable in principle to key stakeholders, including affected boroughs	Local boroughs	Moderate Positive
	Other stakeholders	Moderate Positive
To achieve value for money	Business case	Neutral
	Wider economic benefits	Neutral
	Low cost for users	Slight Negative
	CIL funding potential	Neutral
	Potential for user revenue to offset	Moderate Negative
	Capital cost	Strong Negative

Assessment of Option B2 (DLR extension) – conclusion

4.100. Under Option B2, the DLR would be extended under the Thames from Canning Town to Kidbrooke, Eltham and Falconwood.

4.101. This option has been assessed against the MTS goals and outcomes using SAF and the specific programme objectives.

Goal 1 – support economic development and population growth

4.102. The option performs slightly positively overall against this goal, as it would result in new public transport links to support employment growth.

Goal 2 – quality of life

4.103. The option performs neutrally overall against this goal, with some public transport users benefitting from new links but others impacted by increased network congestion. Road users would see little change.

Goal 3 – safety and security

4.104. The option performs neutrally overall against this goal.

Goal 4 – transport opportunities

4.105. The option performs positively overall against this goal, with new transport links improving accessibility to jobs.

Goal 5 – climate change

4.106. The option performs slightly positively overall against this goal, with an additional rail crossing of the Thames providing improved network resilience.

Goal 6 – support delivery of the London 2012 Olympic and Paralympic Games and its legacy

4.107. The option performs neutrally overall against this goal.

Programme objectives

4.108. **It** is likely that a DLR extension to Eltham would improve transport opportunities however it would have a very limited effect on the volume of traffic demand through the Blackwall tunnel. It could be an improved alternative for up to 4% of the demand, but even this assumes that all drivers within 1 km of the extension could find it convenient to switch to the DLR.

4.109. The scheme would have benefits for certain priority areas, most notably Kidbrooke, but as a new branch off the "Airport route", there would be a reduction in the capability to maximise services to Woolwich and the Royal Docks in the longer term, which is likely to have a negative effect in those areas.

4.110. With little information on costs and benefits, it is not possible to analyse the business case in the round, but the cost would be very substantial, possibly £1bn, and the benefits relatively slight given the limited journey time savings compared with travelling via Lewisham and the disbenefits to users on the Woolwich Arsenal branch.

4.111. As such **it is not recommended that a DLR extension is pursued** as a means of reducing congestion at the Blackwall tunnel.

4.112. It should be noted that this assessment of the DLR concept considers its potential contribution to the problem of ***highway congestion***, and does not mean that such an extension would not have any other merits (such as improving public transport connectivity, reducing journey times, or relieving crowding on other public transport lines such as the DLR from Lewisham). Construction of such a link would provide journey opportunities for people already using other public transport routes, and the improved connectivity could generate demand to travel.

4.113. However, this review has identified some significant feasibility issues (junction close to Canning Town, integration with a road tunnel, construction feasibility along the A102/A2, impact on Eltham station and tunnel) which would be very costly to resolve, and there is the potential to worsen crowding on the busy Woolwich Arsenal line should services be diverted onto this new line. Any further consideration of such an extension would require significant engineering work to assess the viability of solving some of these issues, and public transport modelling to test the impact on journey times, crowding and accessibility.

5. LOWER COST ROAD CROSSINGS (OPTION C)

Introduction

5.1. A relatively low cost way of adding new capacity and connectivity is to provide a vehicle ferry, similar to the existing service at Woolwich. While ferries are less attractive than a fixed link (such as a bridge or tunnel), it may be possible to introduce a ferry service at a lower cost, and also to provide a crossing at a location that a fixed link cannot be provided, due to physical constraints or due to the much greater traffic impacts of a bridge or tunnel.

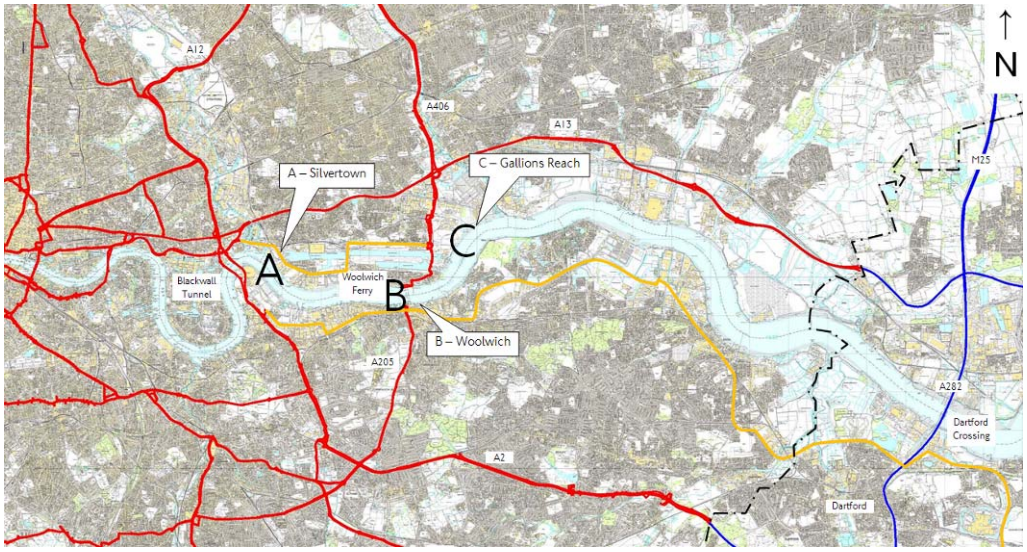
5.2. Potentially a ferry service could be provided at more than one location. It is assumed in all cases that a ferry service would cater for pedestrians and cyclists as well as vehicular traffic.

Feasible locations

5.3. This section summarises the locations where such a crossing could feasibly be provided, and reviews the feasible options against the programme objectives.

5.4. The plan below illustrates the section of the Thames within Greater London from Blackwall to the Dartford crossing, and highlights locations where vehicle ferries may be considered appropriate in terms of potential to link to appropriate locations on the road network and where the pattern of riverside development allows construction of a crossing. Several stretches of the Thames have been considered too challenging to build due to either landside constraints (e.g. existing mature development, nature reserves), or physical obstructions (e.g. the Thames Barrier).

Figure 4.1 – Potential ferry locations



5.5. This section examines further scheme options for locating a new vehicle ferry. These are:

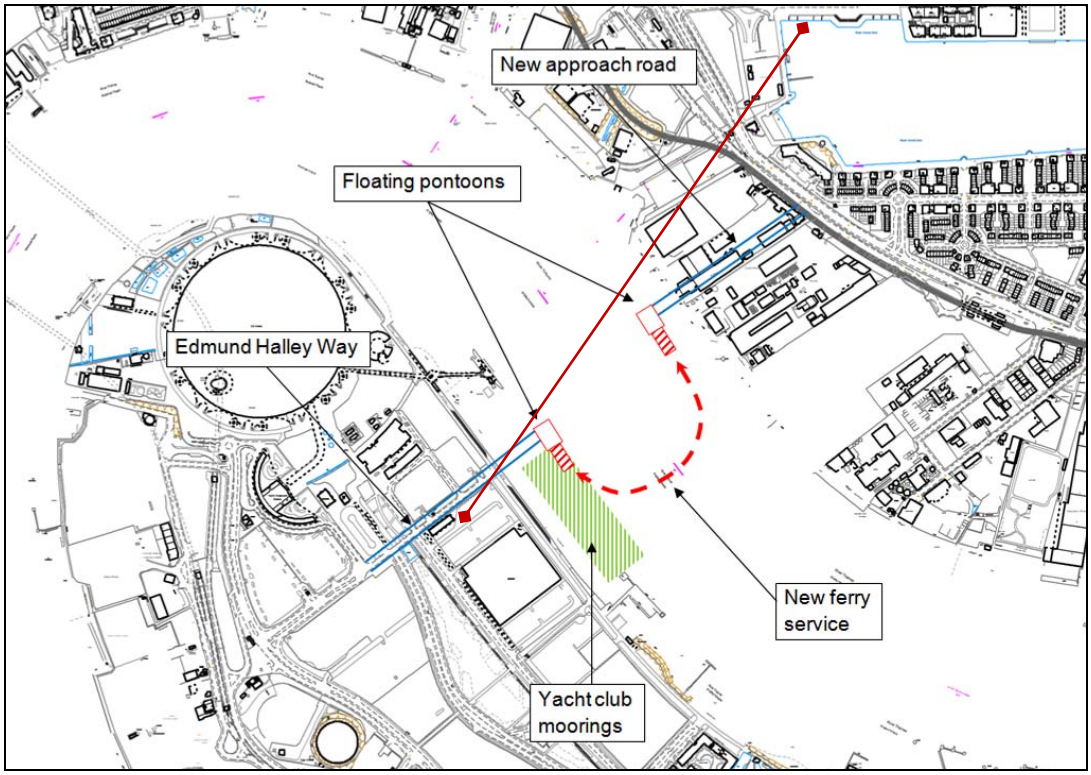
- Option C1: Silvertown
- Option C2: Woolwich (the current ferry location, and effectively the "Do Minimum")
- Option C3: Gallions Reach

OPTION C1: FERRY AT SILVERTOWN

Option C1 – Option description

5.6. The lowest capital cost option for a new vehicular crossing at Silvertown would be to provide a new vehicle ferry. It is appears to be physically feasible, and could take the form sketched in the Figure below.

Figure 4.2 – Sketch of vehicle ferry option



5.7. A ferry would most likely take the form of two self-propelled vehicle ferries, with floating pontoons linked to access roads by linkspans. Chain or cable ferries are likely to be difficult to provide at this location due to the nature of the river walls at this location, although this could be considered further should a vehicle ferry be taken forward as an option.

5.8. However, there are some very significant practical and operational issues around the provision of a vehicle ferry at this location which are set out in the following section.

Option C1 – Assessment against SAF

5.9. The table below summarises the option against the Strategic Assessment Framework.

MTS Challenges	MTS Outcomes	Qualitative Score	Comments
Goal 1: Support economic development and population growth			
Supporting sustainable population and employment growth	Balancing capacity and demand for travel through increasing public transport capacity	Neutral	Pedestrians and cyclists would be able to use the ferry however they are already able to cross here via Jubilee line, Emirates Air Line and Greenwich foot tunnel, so no noticeable impact
	Balancing capacity and demand for travel through reducing the need to travel	Neutral	No impact
Improving transport connectivity	Improving people's access to jobs	Neutral	No impact
	Improving access to commercial markets for freight movements and business travel	Slight Positive	Would provide a crossing point for HGVs very near to the strategic Blackwall tunnel, improving freight links
Delivering an efficient and effective transport system for goods and people	Smoothing traffic flow (managing delay, improving journey time reliability and resilience)	Neutral	Capacity would be around 200 vehicles per hour compared to 3,400 in Blackwall tunnel, and journey time would be longer, so no impact
	Improving public transport reliability	Neutral	No impact
	Reducing operating costs	Slight Negative	Increases operating cost because the ferry costs money to run, and it would carry a low number of vehicles compared to a fixed link
	Bringing and maintaining all assets to a state of good repair	Neutral	No impact
	Enhancing use of the Thames for people and goods	Neutral	Additional crossing point useful for HGVs at Blackwall, however, very low capacity
Goal 2: Quality of Life			
Improving journey experience	Improving public transport customer satisfaction	Neutral	Minimal impact
	Improving road user satisfaction (drivers, pedestrians, cyclists)	Neutral	Minimal impact, would only appeal to road users who cannot use Blackwall due to restrictions
	Reducing public transport crowding	Neutral	No impact
Enhancing the built and natural environment	Enhancing streetscape, improving the perception of urban realm and developing 'better streets' initiatives	Moderate Negative	Access roads on both sides of the river, through Greenwich OA
	Protecting and enhancing the natural environment	Slight Negative	New infrastructure in the river
Improving air quality	Reducing air pollutant emissions from ground based transport, contributing to EU air quality targets	Slight Negative	Congestion in urban area
Improving noise impacts	Improving perceptions and reducing impacts of noise	Neutral	No impact
Improving health impacts	Facilitating an increase in walking and cycling	Neutral	No impact
Goal 3: Safety and security			
Reducing crime, fear of crime and anti-social behaviour	Reducing crime rates (and improving perceptions of personal safety and security)	Neutral	No impact
Improving road safety	Reducing the numbers of road traffic casualties	Neutral	No impact
Improving public transport safety	Reducing casualties on public transport networks	Neutral	No impact

Goal 4: Transport Opportunities			
Improving accessibility	Improving the physical accessibility of the transport system	Neutral	No impact
	Improving access to services	Neutral	No impact
Supporting regeneration and tackling deprivation	Supporting wider regeneration	Slight Negative	Negative impact on Greenwich OA due to ferry access road and queues building up along them through a residential area, would discourage walk and cycle trips
Goal 5: Climate change			
Reducing CO_2 emissions	Reducing CO_2 emissions from ground based transport, contributing to a London-wide 60% reduction by 2025	Slight Negative	Congestion in urban area
Adapting for climate change	Maintaining the reliability of transport networks	Neutral	Improves resilience in terms of reducing the number of over height vehicle incidents at Blackwall tunnel. However no scope to improve resilience in the case of a full closure of the tunnel, due to much smaller capacity
Goal 6: Support delivery of the London 2012 Olympic and Paralympics Games and its legacy			
Developing and implementing a viable and sustainable legacy for the 2012 Games	Supporting regeneration and convergence of social and economic outcomes between the five Olympic boroughs and the rest of London	Neutral	No impact
	Physical transport legacy	Neutral	No impact
	Behavioural transport legacy	Neutral	No impact
Deliverability and Risks		**Option 4**	
		Silvertown ferry	
Issue	**Assessment Criteria**		
Deliverability and Acceptability Risks	Engineering feasibility risk	Medium	Not much space available
	Complexity of delivery (risk)	Medium	Impact on development area, Emirates Air Line, yatch club etc
	Consent risk	Medium	Powers would be required
	Funding risk	High	No funding secured
	Stakeholder acceptability risk	High	Does not solve Blackwall problem and development conflict
	Public acceptability risk	Medium	Visual and traffic impact on huge residential development area
	Overall deliverability risk	High	
Complexity of operation	Operational feasibility risk	Medium	Bend in the river and busy part of river, could be managed using navigational aids
Value for Money	Benefit Cost Ratio	Unknown	Not quantified
Affordability and Financial Sustainability	CAPEX	£50m < £200m	£50-80m, £150m outturn prices
	OPEX per annum	£5m < £10m	Estimate is £5m per year, could increase with longer operating hours or other changes
	Revenue implications per annum		No revenue or very low revenue
	Funding potential within TfL budget	Low	No funding available
	Funding potential with private finance, e.g. via S106, securitisation of revenue, and DfT	Low	No development benefits so no funding potential
Timescales	Timescale for delivering the changes	Medium-term	
	Program risk	Medium	

Option C1 – Assessment against programme objectives

Option C1 – improving the efficiency of the highway network

Peak congestion

5.10. A vehicle ferry is a relatively low capacity link. It can provide a very valuable link where no alternative fixed link exists and demand is relatively light, but is very low in capacity compared with a fixed link. The almost adjacent Blackwall tunnel can carry up to 3,400 vehicles per hour in the peak direction, while a ferry service could carry up to around 200.

5.11. A vehicle ferry here would be likely to attract almost no traffic based on the journey times compared with the almost adjacent Blackwall tunnel.

Crossing resilience and network reliability

5.12. A key advantage of a vehicle ferry at this location, so close to Blackwall, is that it provides a nearby alternative crossing point for vehicles unable to use the Blackwall tunnel due to their size or hazardous cargoes. Potentially a ferry here could reduce the number of overheight vehicle incidents at Blackwall, which would bring benefits to all users of the Blackwall tunnel (and other local road users).

5.13. However, there would be times when general traffic did seek to use the ferry – such as during a closure of the tunnel. In these circumstances the ferry would be unable to cater for the level of diverted traffic which would occur, and widespread congestion would be inevitable. This would be similar to the current problems at Blackwall but would cause the disruption to spread to the ferry approaches as well. In the event of an incident closing the Blackwall tunnel, a vehicle ferry would provide very little resilience, as demand would exceed the capacity by a very large margin. A vehicle ferry would therefore provide little or no additional resilience for the highway network.

Journey times

5.14. Inherent in any vehicle ferry journey time is a boarding/alighting delay, even for those vehicles arriving with fortuitous timing. At a minimum, once vehicles are loaded onto the ferry, there will be a short delay while the ferry is prepared for departure. The crossing itself will be relatively slow compared to driving across a fixed link, and there will be another delay while the ferry docks and the exit is opened.

5.15. Average delays will be longer than this, as most vehicle will not happen to arrive just as boarding is closing; with a ten minute frequency (as achieved at Woolwich), in simple terms there will be an average wait of five minutes. This will be longer whenever the ferry departure has to wait for river shipping to pass or if there is any delay in boarding or alighting, such as another vehicle stalling.

5.16. Such delays do not present a significant problem where the road crossing is some distance away; a vehicle travelling between Woolwich and the Royal Docks, for example, is likely to be prepared to wait a few minutes for the ferry because it is still faster than the much longer diversion via an alternative crossing point.

5.17. However, close to a fixed link such as the Blackwall tunnel, these additional delays would present a very significant disincentive to use a ferry crossing, to the extent that it is unlikely that there would be any demand for a vehicle ferry except when the Blackwall tunnel is over capacity. Even in that event, a ferry could provide little resilience.

5.18. Journey times would be unfavourable compared with the Blackwall tunnel. With a frequency of around 10 minutes (assuming two boats in operation) there would be an average wait of around 5 minutes *assuming no excess queues*.

5.19. Journeys times are such that in normal conditions, with the Blackwall tunnel open, there is unlikely to be any demand with the exception of overheight vehicles.

Option C1 – supporting the public transport network

5.20. A ferry in this location would provide no significant additional public transport utility given the proximity of the Emirates Air Line and Jubilee line.

Option C1 – integrating with land use policies

5.21. A ferry in this location, while physically feasible, would in practice conflict with the development plans for the areas on either side of the river, particularly on the Greenwich Peninsula. It would entail large vehicles crossing the peninsula and queuing for the ferry through an area designated as residential-led mixed use, and for which development has begun.

5.22. A new approach road could be built on the northern side to meet the linkspan. This would cross industrial land, and while it would represent a cost, it is likely to be achievable.

5.23. On the southern side, traffic would approach a new ferry by one of the existing roads within the Greenwich peninsula. In the sketch above it has been assumed that it would be Edmund Halley Way.

5.24. In all options, the approach road would pass across the Greenwich Peninsula masterplan area, which is a major regeneration site with around 10,000 new homes built, under construction or planned (with outline planning permission).

5.25. Any access road crossing the peninsula carrying through and queuing traffic (including HGVs) would impose significant problems for the implementation of the masterplan, would not meet local planning policies, and would be opposed by stakeholders. The setting of the Emirates Air Line would be very compromised by the introduction of ferry traffic.

5.26. As a result, it is likely that the land impacts of a vehicle ferry would be very negative in this location.

Option C1 – impacts on health, safety and the environment

5.27. The scheme is likely to offer environmental improvements over the existing Woolwich ferry service in terms of efficiency and emissions, however, these benefits are likely to be marginally outweighed by the negative environment impacts upon the

river environment associated with the new infrastructure. The likely negative environmental impacts are not considered insurmountable as they are potentially short term and can be largely mitigated.

5.28. It is unlikely that the scheme would provide any significant new access to walking and cycling routes or health facilities and therefore would have a neutral impact upon health.

Option C1 – borough and other stakeholder views

5.29. Local stakeholders, including the local boroughs and developers/landowners, are likely to be very opposed to the provision of a vehicle ferry here, due to the impact on development sites and failure to address the problems.

5.30. A vehicle ferry at this location is not operationally ideal as far as river navigation is concerned, being close to a major bend in the Thames at Blackwall. However, it is possible that with navigational aids this could be mitigated.

5.31. Additionally, this section of the Thames is home to the Greenwich Yacht Club on the south side, whose moorings would be very significantly affected by a ferry at this location, and safeguarded wharves on the northern bank, whose operation may be compromised by the presence of pontoons and linkspans.

Option C1 – achieving value for money

5.32. A new vehicle ferry would cost in the order of £50 – 80 million to construct at current prices, and around £5 million per annum in operating costs. With future inflation and contingency this would be likely to rise to around £150 million in outturn prices. In addition, there would be costs associated with land and construction of access roads and queuing areas.

5.33. Given the lack of journey time benefits for a ferry crossing so close to Blackwall, it is expected that the business case would be negative, although given the problems identified above no formal business case analysis has been undertaken.

Option C1 – Programme objective summary

5.34. The table below summarises the option of a vehicle ferry against the programme objectives.

		C1. New Silvertown ferry
To improve the efficiency of the highway network in the London Thames Gateway, especially at river crossings, and provide greater resilience for all transport users	Peak Blackwall congestion	Neutral
	Blackwall crossing resilience	Neutral
	Connectivity east of Greenwich	NA
	Approach road independence	Slight Negative
	Local road reliability (Greenwich)	Slight Negative
	Local road reliability (Woolwich)	Neutral
To support the needs of existing businesses in the area and to encourage new business investment	Local road reliability (Bexley)	Neutral
	Local road reliability (Royal Docks)	Slight Negative
	JTs across sub-region (peak)	Neutral
	JTs across sub-region (off-peak)	Neutral
To support the provision of public transport services in the London Thames Gateway	Reliability of local buses	Neutral
	Allows new orbital public transport	Neutral
	Mode shift potential, car to public	Neutral
To integrate with local and strategic land use policies	Lower Lea Valley OA	Neutral
	Greenwich Peninsula OA	Moderate Negative
	Royal Docks OA	Slight Negative
	London Riverside OA	Neutral
	Bexley Riverside OA	Neutral
	Thamesmead & Abbey Wood OA	Neutral
	Woolwich OA	Neutral
	Charlton Riverside OA	Neutral
To minimise the impacts of any proposals on health, safety and the environment	Health	Neutral
	Safety	Neutral
	Environment	Neutral
To ensure where possible that any proposals are acceptable in principle to key stakeholders, including affected boroughs	Local boroughs	Moderate Negative
	Other stakeholders	Slight Negative
To achieve value for money	Business case	Slight Negative
	Wider economic benefits	Neutral
	Low cost for users	Neutral
	CIL funding potential	Neutral
	Potential for user revenue to offset	Slight Negative
	Capital cost	Slight Negative

Assessment of Option C1 (Silvertown ferry) – conclusion

5.35. Under Option C1, a new vehicle ferry service would be provided at Silvertown.

5.36. This option has been assessed against the MTS goals and outcomes using SAF and the specific programme objectives.

Goal 1 – support economic development and population growth

5.37. The option performs neutrally overall against this goal.

Goal 2 – quality of life

5.38. The option performs negatively overall against this goal, with the crossing conflicting with development plans on the Greenwich peninsula.

Goal 3 – safety and security

5.39. The option performs neutrally overall against this goal.

Goal 4 – transport opportunities

5.40. The option performs slightly negatively overall against this goal, with ferry queues impacting upon the walking and cycling routes on the Greenwich peninsula.

Goal 5 – climate change

5.41. The option performs slightly negatively overall against this goal, with increased traffic queues in an urban part of east/south east London.

Goal 6 – support delivery of the London 2012 Olympic and Paralympic Games and its legacy

5.42. The option performs neutrally overall against this goal.

Programme objectives

5.43. This option has a negative impact on some of the MTS policies, and fails to meet the programme objectives due to its low capacity, failure to shorten journey times and impacts on the development of the local area. In particular, it is highly likely to be opposed by some key stakeholders including the Royal Borough of Greenwich and London Borough of Newham, because the ferry would entail queuing traffic within areas which are designated for development (residential on the south side).

5.44. Given this analysis, **it is not recommended for further work**.

OPTION C2: FERRY AT WOOLWICH

Option C2 – Option description

5.45. The existing Woolwich Ferry is operated by TfL under a legal obligation dating to 1885. The current ferries and pier started service in 1963, almost 50 years ago, and are becoming increasingly difficult and costly to maintain, with increasing risks of failures.

5.46. Given the age and condition of the infrastructure, the "Do nothing" option is effectively to run the ferries for as long as possible, and then to close the service. However, given the legal obligation to provide the service, TfL may be unable to pass the legislation required to cease operation unless a reasonable alternative service is provided instead.

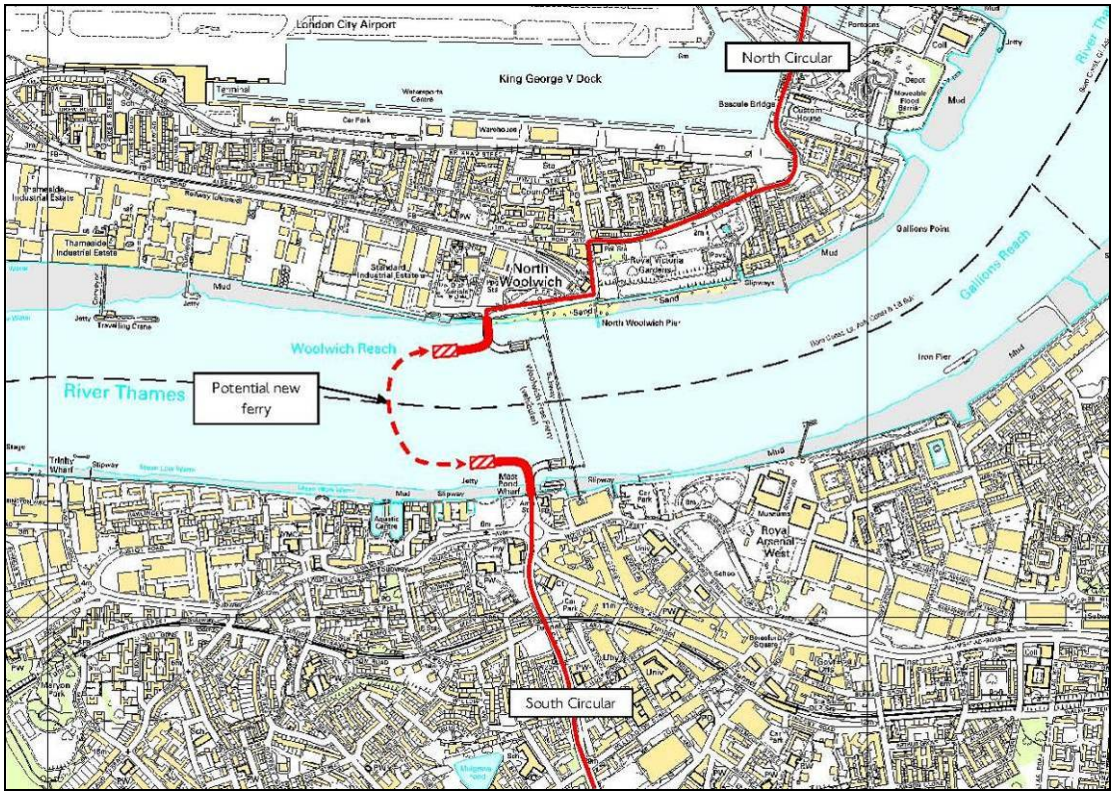
5.47. Given the bespoke nature of the system, such as the hydraulically lifted piers, it is highly unlikely that a simple like-for-like replacement of the boats could be undertaken; any replacement ferry would therefore effectively be a new facility.

5.48. This scenario therefore effectively represents the "Do Minimum" scenario for the proposes of comparison with other options, although it should be noted that it is currently unfunded, and potentially may not go ahead if an alternative option provides a better value means of replacing this connectivity.

5.49. Replacement infrastructure (ferries and associated land and marine infrastructure) could be procured for a new vehicle ferry service on the existing alignment. The new assets would be expected to have a useful operating life of 30 years or more.

5.50. In order to keep existing facilities open whilst new ones are constructed, pontoons may need to be built on the upstream side of the piers (see Figure below). This would put the ferry operation closer to residential properties on the southern side but has the potential for part of the construction to take place while the existing ferry remains in service. Alternatively, to reduce the impact on local residents, the ferry could replicate the existing arrangements on the eastern side of the piers; however this would entail a fairly lengthy closure of the facility.

Figure 4.3 - Woolwich ferry, with potential new service on upstream side



5.51. Boarding and alighting would be likely to use floating pontoons rather than the current mechanically lifting linkspans. Connected to the land via a hinged bridge, pontoons would float up and down with the tide; ferries would have moving, hinged ramps which would lower onto the pontoon to enable traffic to board and alight. This would reduce energy consumption considerably.

5.52. The capacity is likely to be higher than the current service; the detailed configuration of boats, pontoons, linkspans and approach roads will define the capacity accurately, but based on advice from TfL's consultants, it has been assumed that the service would offer around 30% more capacity than the current ferry.

5.53. It is estimated that the timescales to procure a replacement service would be around three to four years (including planning, consents, design and construction). The earliest a replacement service could be in operation is estimated at 2017.

Option C2 – Assessment SAF

5.54. The table below summarises the option against the Strategic Assessment Framework.

MTS Challenges	MTS Outcomes	Qualitative Score	Comments
Goal 1: Support economic development and population growth			
Supporting sustainable population and employment growth	Balancing capacity and demand for travel through increasing public transport capacity	Neutral	No impact
	Balancing capacity and demand for travel through reducing the need to travel	Neutral	No impact
Improving transport connectivity	Improving people's access to jobs	Neutral	No impact
	Improving access to commercial markets for freight movements and business travel	Neutral	Increase in capacity compared to existing ferry but minimal impact
Delivering an efficient and effective transport system for goods and people	Smoothing traffic flow (managing delay, improving journey time reliability and resilience)	Neutral	No impact
	Improving public transport reliability	Neutral	No impact
	Reducing operating costs	Slight Positive	Would be cheaper to run than maintaining the existing ferry
	Bringing and maintaining all assets to a state of good repair	Moderate Positive	Replace old ferry with new - replacing existing asset
	Enhancing use of the Thames for people and goods	Neutral	No impact
Goal 2: Quality of Life			
Improving journey experience	Improving public transport customer satisfaction	Neutral	No impact
	Improving road user satisfaction (drivers, pedestrians, cyclists)	Neutral	There would be an increase in capacity which would reduce journey times, but this is unlikely to have a noticable impact on customer satisfaction
	Reducing public transport crowding	Neutral	No impact
Enhancing the built and natural environment	Enhancing streetscape, improving the perception of urban realm and developing 'better streets' initiatives	Neutral	No impact
	Protecting and enhancing the natural environment	Neutral	New ferry infrastructure however in the same location as existing ferry
Improving air quality	Reducing air pollutant emissions from ground based transport, contributing to EU air quality targets	Neutral	No impact
Improving noise impacts	Improving perceptions and reducing impacts of noise	Neutral	No impact
Improving health impacts	Facilitating an increase in walking and cycling	Neutral	No impact
Goal 3: Safety and security			
Reducing crime, fear of crime and anti-social behaviour	Reducing crime rates (and improving perceptions of personal safety and security)	Neutral	No impact
Improving road safety	Reducing the numbers of road traffic casualties	Neutral	No impact
Improving public transport safety	Reducing casualties on public transport networks	Neutral	No impact

Goal 4: Transport Opportunities			
Improving accessibility	Improving the physical accessibility of the transport system	Neutral	No impact
	Improving access to services	Neutral	No impact
Supporting regeneration and tackling deprivation	Supporting wider regeneration	Neutral	No impact
Goal 5: Climate change			
Reducing CO_2 emissions	Reducing CO_2 emissions from ground based transport, contributing to a London-wide 60% reduction by 2025	Neutral	No impact
Adapting for climate change	Maintaining the reliability of transport networks	Neutral	No impact
Goal 6: Support delivery of the London 2012 Olympic and Paralympics Games and its legacy			
Developing and implementing a viable and sustainable legacy for the 2012 Games	Supporting regeneration and convergence of social and economic outcomes between the five Olympic boroughs and the rest of London	Neutral	No impact
	Physical transport legacy	Neutral	No impact
	Behavioural transport legacy	Neutral	No impact
Deliverability and Risks		**Option 5**	
		Woolwich ferry (do minimum)	
Issue	**Assessment Criteria**		
Deliverability and Acceptability Risks	Engineering feasibility risk	Low	Ferry should be simple design
	Complexity of delivery (risk)	Low	Need to build in interaction with the existing ferry
	Consent risk	Low	Same location as existing
	Funding risk	High	No funding secured
	Stakeholder acceptability risk	Medium	Construction impacts, unresolved traffic issues
	Public acceptability risk	Low	No noticeable change so acceptable
	Overall deliverability risk	Medium	
Complexity of operation	Operational feasibility risk	Low	
Value for Money	Benefit Cost Ratio	Unknown	Do minimum option against which others are tested
Affordability and Financial Sustainability	CAPEX	£50m < £200m	£60m, £120m outturn prices
	OPEX per annum	£5m < £10m	Estimate is £5m per year, could increase with longer operating hours or other changes
	Revenue implications per annum		No revenue or very low revenue
	Funding potential within TfL budget	Medium	Due to TfL obligation to provide Woolwich ferry, it is likely that funding would be secured
	Funding potential with private finance, e.g. via S106, securitisation of revenue, and DfT	Low	No development benefits
Timescales	Timescale for delivering the changes	Medium-term	
	Program risk	Medium	

Option C2 – Assessment against programme objectives

Option C2 – improving the efficiency of the highway network

Peak congestion

5.55. There are options for increasing capacity; it is estimated by TfL's advisors that an increase in capacity of around 30% could be delivered without any significant changes in method of operation through provision of larger craft; this has been used as the basis of assessment. However, the actual uplift in capacity will be influenced by the type of vessel available on the market at the time of tender, the boarding/alighting procedures, docking times, etc.

5.56. The option would make a contribution to reducing congestion at Blackwall compared to closing the ferry at Woolwich, as these users would need to divert to the Blackwall tunnel (or, for certain vehicles such as tall goods vehicles, Dartford), but it would make little impact on congestion at Blackwall compared with the current situation.

Crossing resilience and network reliability

5.57. A new ferry would be more reliable than the current ferry due to its age, but as with all such crossings it would remain subject to disruption due to adverse weather, such as fog. An increase in capacity is unlikely to be sufficiently great to make the crossing any better at handling diverted traffic in the event of another crossing, such as Blackwall, being closed.

5.58. At times when delays are occurring – such as due to a reduced ferry service, or the impacts of traffic diverting to the ferry from another crossing – queues are likely to have an effect on the wider highway network. As outlined in the Assessment of Need report, these impacts can be severe, affecting local traffic which is not seeking to cross the river, including local bus services.

Journey times

5.59. Journey times for a replacement ferry are likely to be similar to the existing Woolwich ferry.

Option C2 – supporting the public transport network

5.60. The Woolwich ferry provides a much reduced function as part of the public transport network since the DLR was been extended to Woolwich, although it does still provide a link between the bus networks on either side of the river for some passengers.

5.61. As outlined in the Assessment of Needs report, the queues for the Woolwich ferry can have a detrimental effect on the operation of bus services on both sides of the river, with queuing traffic obstructing the public highway beyond the ferry queuing area. While a slightly higher capacity may reduce the frequency or extent of these problems, there is little or no space to increase queuing capacity, so these problems would remain.

Option C2 – integrating with land use policies

5.62. Retention of a ferry at Woolwich is likely to be beneficial for regeneration plans for the local areas, compared with its closure and diversion of traffic to Blackwall.

Option C2 – impacts on health, safety and the environment

5.63. The scheme is likely to offer environmental improvements over the existing Woolwich ferry service in terms of efficiency and emissions, however, these benefits are likely to be marginally outweighed by the negative environment impacts upon the river environment associated with the new infrastructure. The likely negative environmental impacts are not considered insurmountable as they are potentially short terms and can be largely mitigated.

5.64. It is unlikely that the scheme would provide any significant new access to walking and cycling routes or health facilities and therefore would have a neutral impact upon health.

Option C2 – borough and other stakeholder views

5.65. The Woolwich Ferry is valued by many stakeholders, including the local boroughs.

5.66. However, there are issues with the current operations, in particular the presence of queues on the southern side and large vehicles in narrow streets on the northern side (see picture), which suggest that the loss of the Woolwich ferry may be acceptable provided that an alternative crossing is provided somewhere downriver of the Greenwich Peninsula (e.g. Gallions Reach) to cater for existing ferry users.

Figure 4.4 - Conflict in North Woolwich, LB Newham

Option C2 – achieving value for money

5.67. Initial estimates put the capital cost at around £60 million (in 2010 prices). With risk and inflation this is likely to rise to around £100 million in outturn prices. Annual operating costs are estimated to be around £5 million per annum (which is slightly lower than at present given that the replacement service will be more efficient to operate and maintain).

5.68. If the Woolwich ferry was closed without replacement (either here or nearby), the effect on users' journey times would be significant, with long diversions to busy alternative crossings.

Option C2 – Programme objective summary

5.69. The table below summarises the option of a new vehicle ferry at Woolwich against the programme objectives; however it is important to note that **this option represents the Do Minimum scenario** and therefore scores neutrally on all measures.

		C2. New Woolwich ferry
To improve the efficiency of the highway network in the London Thames Gateway, especially at river crossings, and provide greater resilience for all transport users	Peak Blackwall congestion	Neutral
	Blackwall crossing resilience	Neutral
	Connectivity east of Greenwich	Neutral
	Approach road independence	Neutral
	Local road reliability (Greenwich)	Neutral
	Local road reliability (Woolwich)	Neutral
To support the needs of existing businesses in the area and to encourage new business investment	Local road reliability (Bexley)	Neutral
	Local road reliability (Royal Docks)	Neutral
	JTs across sub-region (peak)	Neutral
	JTs across sub-region (off-peak)	Neutral
To support the provision of public transport services in the London Thames Gateway	Reliability of local buses	Neutral
	Allows new orbital public transport	Neutral
	Mode shift potential, car to public	Neutral
To integrate with local and strategic land use policies	Lower Lea Valley OA	Neutral
	Greenwich Peninsula OA	Neutral
	Royal Docks OA	Neutral
	London Riverside OA	Neutral
	Bexley Riverside OA	Neutral
	Thamesmead & Abbey Wood OA	Neutral
	Woolwich OA	Neutral
	Charlton Riverside OA	Neutral
To minimise the impacts of any proposals on health, safety and the environment	Health	Neutral
	Safety	Neutral
	Environment	Neutral
To ensure where possible that any proposals are acceptable in principle to key stakeholders, including affected boroughs	Local boroughs	Neutral
	Other stakeholders	Neutral
To achieve value for money	Business case	Neutral
	Wider economic benefits	Neutral
	Low cost for users	Neutral
	CIL funding potential	Neutral
	Potential for user revenue to offset	Neutral
	Capital cost	Neutral

Assessment of Option C2 (Woolwich ferry) – conclusion

5.70. Under Option C2, a new vehicle ferry service would be provided at Woolwich, replacing the current service.

5.71. This option has been assessed against the MTS goals and outcomes using SAF and the specific programme objectives.

Goal 1 – support economic development and population growth

5.72. The option performs slightly positively overall against this goal.

Goal 2 – quality of life

5.73. The option performs neutrally overall against this goal.

Goal 3 – safety and security

5.74. The option performs neutrally overall against this goal.

Goal 4 – transport opportunities

5.75. The option performs neutrally overall against this goal.

Goal 5 – climate change

5.76. The option performs neutrally overall against this goal.

Goal 6 – support delivery of the London 2012 Olympic and Paralympic Games and its legacy

5.77. The option performs neutrally overall against this goal.

Programme objectives

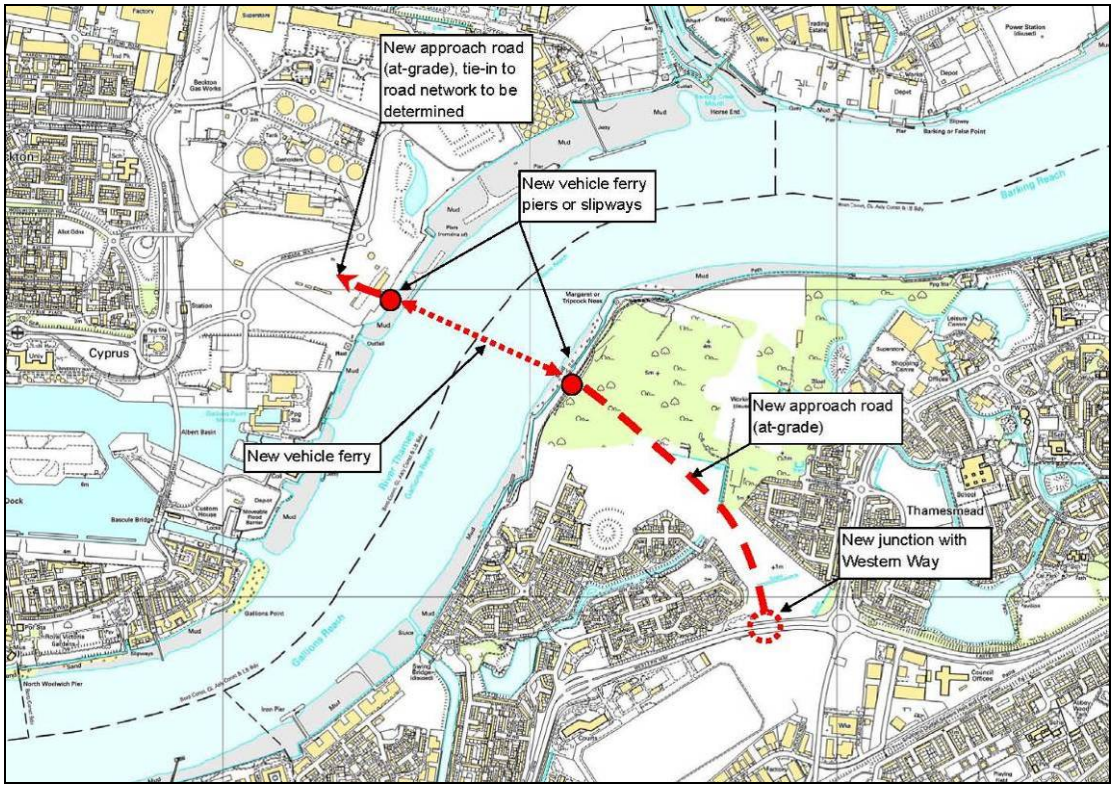
5.78. **It is recommended that a new ferry on the site of the Woolwich ferry is considered further**, although there may be a case for pursuing an alternative location if it proves feasible and to deliver more benefits (see Option C3 below).

OPTION C3: FERRY AT GALLIONS REACH

Option C3 – Option description

5.79. An alternative to replacing the ferry at Woolwich would be to move the facility downstream to Gallions Reach where it would operate between Thamesmead on the southern side and Beckton on the northern side. This location would take advantage of the corridor which has been safeguarded for provision of a road bridge.

Figure 4.5 - Location and indicative route of proposed crossing and access links at Gallions Reach



5.80. As with Woolwich, it is likely that new facilities could increase vehicle carrying capacity by around 30%, with the ability to carry high-sided HGVs. The new assets would be expected to have a useful operating life of 30 years or more.

5.81. It may also be possible to build a chain ferry at Gallions Reach, where there is more space than at Woolwich for the necessary slipways. This would be a similar arrangement to the Torpoint ferry between Plymouth and Cornwall, which carries double the flows of the Woolwich Ferry and operates over a similar distance to Gallions Reach.

5.82. There are more navigational issues to be overcome with a chain ferry, although the Torpoint Ferry operates as a useful template, as this crossing needs to accommodate both a high level of smaller craft as well as large naval craft, which pass this ferry en route to the Devonport naval base.

5.83. A chain ferry would also have more potential environmental impacts, particularly on the foreshore. While a pontoon arrangement would bridge over the foreshore, a chain ferry would require a slipway to be constructed.

5.84. However, chain ferries are cheaper to operate compared with self-propelled ferries, as they can be operated with fewer staff, and are more energy efficient.

5.85. By virtue of relocation, continuity of service could be retained; construction at Gallions Reach could take place away from existing operations at Woolwich, allowing services to be maintained throughout construction, whereas a new facility at Woolwich would be more disruptive to services.

5.86. A crossing at Gallions Reach is slightly further from the existing South Circular Road than Woolwich, but access is nonetheless good for a crossing of this capacity. A feeder route would be constructed from the A2016 on the south side; a 1 km access road would have sufficient capacity to act as a queuing facility providing 'in-line' stacking space for all motorised users, and access to the ferry terminal for buses.

5.87. On the north side there are three options linking to the road network. The options have varying costs, land take and highway capacity impacts, but all provide a short route to the North Circular Road.

Option C3 – Assessment against SAF

5.88. The table below summarises the option against the Strategic Assessment Framework.

MTS Challenges	MTS Outcomes	Qualitative Score	Comments
Goal 1: Support economic development and population growth			
Supporting sustainable population and employment growth	Balancing capacity and demand for travel through increasing public transport capacity	Slight Positive	Minimal impact, new cross river link for pedestrians and cyclists in new area, however, the Woolwich ferry link would be lost (although there are alternatives there DLR and foot tunnel)
	Balancing capacity and demand for travel through reducing the need to travel	Neutral	No impact
Improving transport connectivity	Improving people's access to jobs	Slight Positive	New travel option between Thamesmead, Abbey Wood and north Bexley areas and north of the river which would improve access to jobs
	Improving access to commercial markets for freight movements and business travel	Slight Positive	Better location for cross river freight movements
Delivering an efficient and effective transport system for goods and people	Smoothing traffic flow (managing delay, improving journey time reliability and resilience)	Neutral	Ferry would be new but still affected by outside influences particularly the weather, no impact
	Improving public transport reliability	Neutral	No impact
	Reducing operating costs	Slight Positive	Would be cheaper to run than existing Woolwich ferry
	Bringing and maintaining all assets to a state of good repair	Moderate Positive	Replace old ferry with new - replacing existing asset
	Enhancing use of the Thames for people and goods	Slight Positive	Minimal positive impact
Goal 2: Quality of Life			
Improving journey experience	Improving public transport customer satisfaction	Neutral	No impact
	Improving road user satisfaction (drivers, pedestrians, cyclists)	Slight Positive	Better location for road river crossing
	Reducing public transport crowding	Neutral	No impact
Enhancing the built and natural environment	Enhancing streetscape, improving the perception of urban realm and developing 'better streets' initiatives	Slight Negative	Pedestrians and cyclists would be forced to use the Woolwich foot tunnel which is less pleasant than the ferry
	Protecting and enhancing the natural environment	Moderate Negative	New infrastructure in river and new road on south side
Improving air quality	Reducing air pollutant emissions from ground based transport, contributing to EU air quality targets	Neutral	No impact
Improving noise impacts	Improving perceptions and reducing impacts of noise	Neutral	New road would be constructed but it would be possible to mitigate the noise impact through landscaping
Improving health impacts	Facilitating an increase in walking and cycling	Neutral	No impact
Goal 3: Safety and security			
Reducing crime, fear of crime and anti-social behaviour	Reducing crime rates (and improving perceptions of personal safety and security)	Neutral	No impant
Improving road safety	Reducing the numbers of road traffic casualties	Neutral	No impant
Improving public transport safety	Reducing casualties on public transport networks	Neutral	No impant

Goal 4: Transport Opportunities			
Improving accessibility	Improving the physical accessibility of the transport system	Slight Positive	New ferry would be accessible and would provide a new accessible cross river link
	Improving access to services	Slight Positive	New cross river link enabling better access to local services
Supporting regeneration and tackling deprivation	Supporting wider regeneration	Slight Positive	New cross river link for Thamesmead which is a growth area of the London Plan
Goal 5: Climate change			
Reducing CO_2 emissions	Reducing CO_2 emissions from ground based transport, contributing to a London-wide 60% reduction by 2025	Neutral	No impact
Adapting for climate change	Maintaining the reliability of transport networks	Slight Positive	There is more space here for traffic queueing for the ferry so it should improve the reliability of the local road network
Goal 6: Support delivery of the London 2012 Olympic and Paralympics Games and its legacy			
Developing and implementing a viable and sustainable legacy for the 2012 Games	Supporting regeneration and convergence of social and economic outcomes between the five Olympic boroughs and the rest of London	Slight Positive	New cross river link in east London which would improve connectivity and may help convergence
	Physical transport legacy	Neutral	No impact
	Behavioural transport legacy	Neutral	No impact
Deliverability and Risks		**Option 6**	
		Gallions Reach ferry	
Issue	**Assessment Criteria**		
Deliverability and Acceptability Risks	Engineering feasibility risk	Low	Ferry should be simple design
	Complexity of delivery (risk)	Low	No major issues
	Consent risk	Medium	Powers would be required
	Funding risk	High	No funding secured
	Stakeholder acceptability risk	Medium	LB Bexley support, LB Newham & RB Greenwich would prefer fixed link
	Public acceptability risk	Low	Favourable public consultation response
	Overall deliverability risk	Medium	
Complexity of operation	Operational feasibility risk	Low	
Value for Money	Benefit Cost Ratio	> 4	Approximately 5.2 to 1
Affordability and Financial Sustainability	CAPEX	£50m < £200m	£50-80m, £150m outturn prices
	OPEX per annum	£5m < £10m	Estimate is £5m per year, could increase with longer operating hours or other changes
	Revenue implications per annum		No revenue or very low revenue
	Funding potential within TfL budget	Medium	Due to TfL obligation to provide Woolwich ferry, it is likely that funding would be secured
	Funding potential with private finance, e.g. via S106, securitisation of revenue, and DfT	Low	No expected development benefits
Timescales	Timescale for delivering the changes	Medium-term	
	Program risk	Medium	

Option C3 – Assessment against programme objectives

Option C3 – improving the efficiency of the highway network

Peak congestion

5.89. There are options for increasing capacity above the capacity of the current Woolwich ferry; it is estimated by TfL's advisors that an increase in capacity of around 30% could be delivered without any significant changes in method of operation through provision of larger craft; this has been used as the basis of assessment. However, the actual uplift in capacity will be influenced by the type of vessel available on the market at the time of tender, the boarding/alighting procedures, docking times, etc.

5.90. This will have little impact on the levels of congestion at Blackwall, but would move the queues away from the current Woolwich ferry if it replaced that facility, or very much reduce the occurrence, if operated in conjunction with a ferry at Woolwich.

5.91. Traffic modelling suggests there would not be any notable increase in total vehicle trips, as a relocated ferry would maintain (or slightly enhance) the existing ferry capacity and journey times, but would not provide the step change of a fixed link; with a fixed link providing higher capacity, higher speed crossing, and no wait times, a fixed link would be liable to attract much larger volumes of traffic. Given the wait times to cross, a ferry would be attractive to local users, but not to those from further afield, and therefore a ferry should not attract traffic to the sensitive residential roads, particularly those within Bexley which were subject to much debate in the TGB Inquiry.

5.92. In terms of vehicle queuing, the location at Gallions Reach has much greater scope than Woolwich for any queues to be contained within a dedicated approach road, and therefore to minimise the impact on other parts of the highway network; currently ferry queues can be a problem for local non-ferry traffic in both Woolwich and North Woolwich.

Crossing resilience and network reliability

5.93. A new ferry would by its nature be more reliable than the current ferry due to its age, but as with all such crossings it would remain subject to disruption due to weather. An increase in capacity is unlikely to be sufficiently great to make the crossing any better at handling diverted traffic in the event of another crossing, such as Blackwall, being closed.

5.94. Compared with Woolwich, however, this location offers the potential for queuing to take place away from the main road network, thus minimising the impacts of any service delays on the wider community.

Journey times

5.95. Journey times across the Thames for a replacement ferry are likely to be similar to the existing Woolwich ferry. The approach roads would be slightly longer compared with Woolwich, but would tie in to the wider road network at locations which better serve a majority of the traffic using the ferry, and therefore overall the relocation would reduce journey times for most users.

Option C3 – supporting the public transport network

5.96. A new ferry at Gallions Reach would not allow the provision of direct new cross-river transport services. However, it would be suitable for use by pedestrians and cyclists, so with the provision of walking and cycling route to the terminals, and extension of bus routes to the terminals, new cross-river public transport and walking/cycling options could be made available in an area which is currently fairly isolated.

Option C3 – integrating with land use policies

5.97. A new ferry at Gallions Reach would provide better links into and out of the Thamesmead area, which currently suffers from poor connectivity; it is likely to have a beneficial impact on employment in the Thamesmead, Abbey Wood and north Bexley areas. There is some scope for enhancing the areas around the current ferry terminals, in particular in improving the quality of the environment in North Woolwich, as well as around the current ferry terminal in Woolwich, where the current queuing area has good development potential.

Option C3 – impacts on health, safety and the environment

5.98. Risk of refusal of planning consent on environmental or navigational grounds is higher at Gallions Reach than at Woolwich because there is no ferry service in operation in this area at present.

5.99. Chain ferry slipways could have a large footprint in the river as the ramp would need to cover the full tidal range to prevent ferries grounding and allow access for vehicles. Slipways could remove significant amounts of local inter-tidal and sub-tidal habitats.

5.100. Concrete slipways on land and in the river would displace florae and faunae by removing their natural habitat. Given the under-developed nature of the area (due to Thames Gateway Bridge safeguarding) there is a risk that a number of species - some

protected by law - could be affected. Mitigations would need to meet Environment Agency requirements.

5.101. Building a concrete structure in the river would affect flow (speed and volume of water passing various points in the Reach), so the hydrodynamic impacts would need full consideration and mitigation.

5.102. It may be possible to build suspended 'decked' slipways made of wood, these would be less disruptive by allowing water to pass underneath. However, the piles which support them and the reduction in light available for river-based plants to photosynthesise would significantly reduce the quality of the environment – hence alternative habitats would in all likelihood need to be provided.

Option C3 – borough and other stakeholder views

5.103. Views on a ferry at Gallions Reach are mixed; Greenwich and Newham support a ferry as a short term quick win, but are concerned about a ferry becoming semi-permanent and hindering the subsequent delivery of a fixed link. Bexley supports the ferry and would not want it replaced by a fixed link.

5.104. TfL is working with the Port of London Authority and Environment Agency to take into account their views at the earliest stage.

Option B2 – achieving value for money

5.105. A new vehicle ferry would cost in the order of £80 million to construct at current prices; additional costs need to be allowed for land, as well as risk, contingency and inflation, so this is likely to rise to around £150 million in outturn prices. Around £5 million would be required per annum in operating costs (slightly lower than the current Woolwich ferry).

5.106. Even with a delay to board and cross the river, given how significantly this option reduces journey times for those local vehicles using it compared with allowing Woolwich to close, this option has a strong business case.

Option C3 – Programme objective summary

5.107. The performance of new vehicle ferry options against the objectives is set out in the table below.

		C3. New ferry at Gallions
To improve the efficiency of the highway network in the London Thames Gateway, especially at river crossings, and provide greater resilience for all transport users	Peak Blackwall congestion	Neutral
	Blackwall crossing resilience	Neutral
	Connectivity east of Greenwich	Slight Positive
	Approach road independence	Neutral
	Local road reliability (Greenwich)	Neutral
	Local road reliability (Woolwich)	Slight Positive
To support the needs of existing businesses in the area and to encourage new business investment	Local road reliability (Bexley)	Neutral
	Local road reliability (Royal Docks)	Slight Positive
	JTs across sub-region (peak)	Slight Positive
	JTs across sub-region (off-peak)	Slight Positive
To support the provision of public transport services in the London Thames Gateway	Reliability of local buses	Slight Positive
	Allows new orbital public transport	Slight Positive
	Mode shift potential, car to public	Neutral
To integrate with local and strategic land use policies	Lower Lea Valley OA	Neutral
	Greenwich Peninsula OA	Neutral
	Royal Docks OA	Slight Positive
	London Riverside OA	Neutral
	Bexley Riverside OA	Slight Positive
	Thamesmead & Abbey Wood OA	Slight Positive
	Woolwich OA	Slight Positive
	Charlton Riverside OA	Neutral
To minimise the impacts of any proposals on health, safety and the environment	Health	Neutral
	Safety	Neutral
	Environment	Slight Negative
To ensure where possible that any proposals are acceptable in principle to key stakeholders, including affected boroughs	Local boroughs	Moderate Positive
	Other stakeholders	Neutral
To achieve value for money	Business case	Moderate Positive
	Wider economic benefits	Slight Positive
	Low cost for users	Neutral
	CIL funding potential	Neutral
	Potential for user revenue to offset	Slight Negative
	Capital cost	Slight Negative

Assessment of Option C3 (Gallions ferry) – conclusion

5.108. Under Option C3, a new vehicle ferry service would be provided at Woolwich, replacing the current service.

5.109. This option has been assessed against the MTS goals and outcomes using SAF and the specific programme objectives.

Goal 1 – support economic development and population growth

5.110. The option performs positively overall against this goal, with the ferry providing a new cross-river link between Opportunity Areas which are currently poorly served by river crossings.

Goal 2 – quality of life

5.111. The option slightly performs negatively overall against this goal, with new infrastructure required to be built within or on the banks of the river.

Goal 3 – safety and security

5.112. The option performs neutrally overall against this goal.

Goal 4 – transport opportunities

5.113. The option performs positively overall against this goal, with the new crossing point providing a crossing point in an area currently poorly served by river crossings.

Goal 5 – climate change

5.114. The option performs slightly positively overall against this goal, with slightly more resilient operations in this location compared with the existing location at Woolwich.

Goal 6 – support delivery of the London 2012 Olympic and Paralympic Games and its legacy

5.115. The option performs positively overall against this goal, with this ferry location well placed to aid development of the adjacent Opportunity Areas.

Programme objectives

5.116. A new vehicle ferry at Gallions Reach would allow the existing cross-river connectivity between the Blackwall and Dartford crossings to be maintained, and enhanced. Locating a ferry at Gallions Reach is likely to have some additional costs compared with Woolwich, but would provide additional benefits in providing a new link in an area of poor current connectivity, particularly Thamesmead on the southern side; Woolwich is already connected to the Royal Docks by the foot tunnel and DLR, and shortly by Crossrail. It would also remove the regular disruption in Woolwich and North Woolwich associated with ferry queues blocking back beyond the allotted queuing space, which currently hampers local traffic movements.

5.117. Based on the analysis, **a new vehicle ferry at Gallions Reach is recommended for further consideration.**

6. HIGHER COST ROAD CROSSINGS (ROAD TUNNELS & BRIDGES) (OPTION D)

Fixed road links

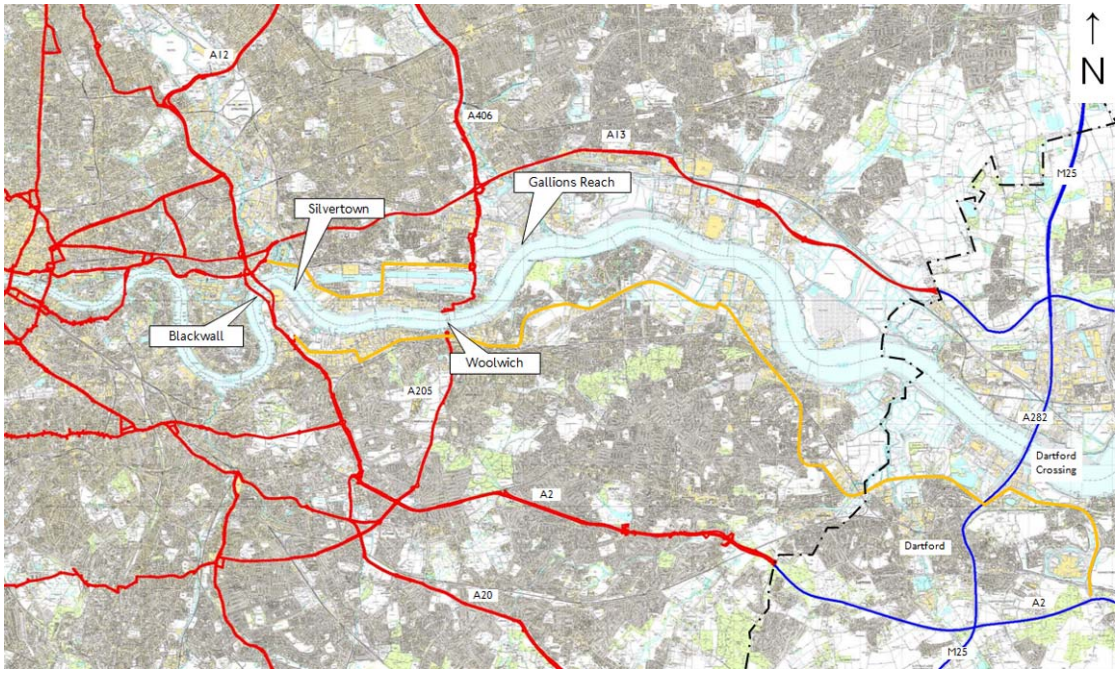
6.1. To provide a higher level of capacity and reliability than a ferry, the next option is to provide a fixed road link, in the form of a tunnel or bridge. These have a much higher capital cost compared with vehicle ferries, but have the advantages of much greater carrying capacity, much faster journey times, ability to carry public transport vehicles (especially cross-river bus services), they are available to traffic 24 hours a day, and – tunnels especially – they are less prone to interruptions to service due to poor weather such as fog or high winds.

6.2. This section summarises the locations where such a crossing could feasibly be provided, and reviews the feasible options against the programme objectives.

Feasible locations

6.3. The plan below illustrates the section of the Thames within Greater London from Blackwall to the Dartford crossing, and highlights sections where fixed links have been considered.

Figure 5.1 – Potential fixed link locations



6.4. The above locations represent those where a fixed link is worthy of consideration in terms of potential to link to appropriate locations on the road network and/or opportunities for the construction of a fixed link. Several stretches of the Thames have been considered too challenging to build due to either landside constraints (e.g. existing mature development, nature reserves), or physical obstructions (e.g. the Thames Barrier).

6.5. This section summarises the following options:

- Option D1: Third Blackwall bore;
- Option D2: Silvertown lifting bridge;
- Option D3: Silvertown bored tunnel;
- Option D4: Silvertown Immersed tunnel;
- Option D5: Woolwich lifting bridge;
- Option D6: Woolwich tunnel;
- Option D7: Thames Gateway Bridge;
- Option D8: Local bridge at Gallions Reach;
- Option D9: Local tunnel at Gallions Reach.

OPTION D1: THIRD BLACKWALL BORE

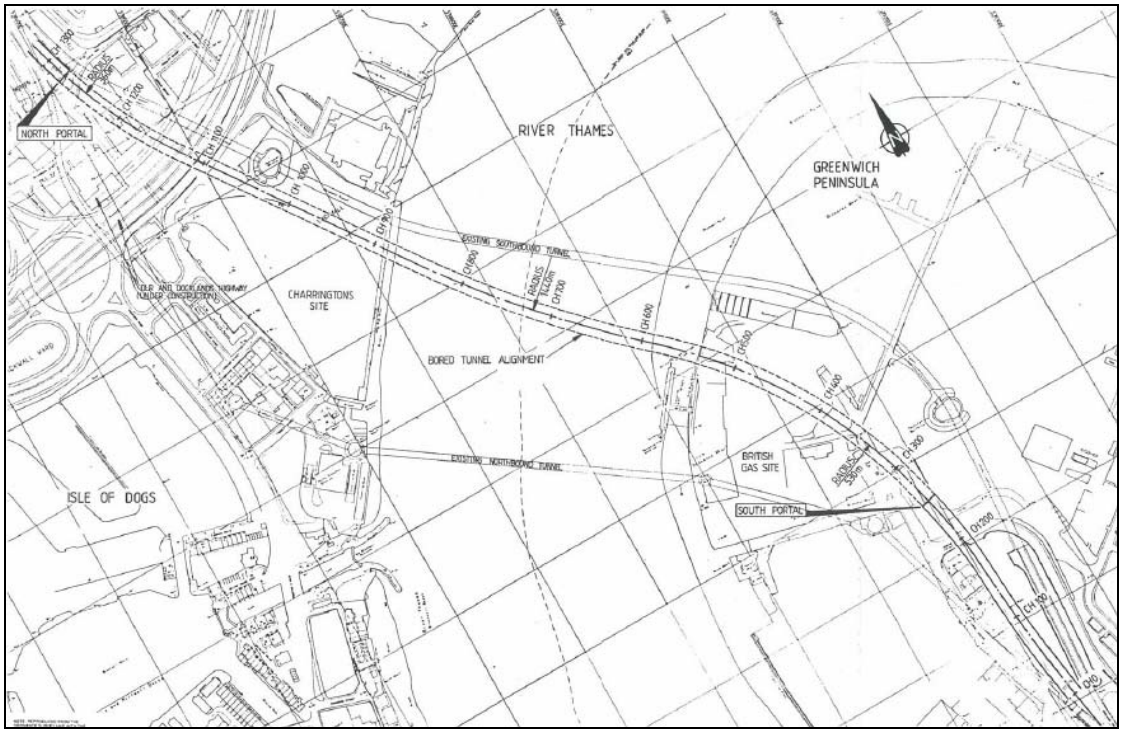
Option D1 – Option description

6.6. A bridge at Blackwall is not considered feasible, given the lack of a route through the densely built-up area for an elevated approach road. The sharp bend in the River Thames is also likely to place much more onerous requirements on such a structure to accommodate the large ships passing along the navigational channel in this area.

6.7. However consideration has been given in the past to construction of a third bore at the Blackwall Tunnel, to either supplement the existing two tunnels, or to replace the oldest (northbound) tunnel with a more modern tunnel incorporating full vehicle clearance.

6.8. The Figure below illustrates the concept of a third bore for Blackwall, from 1990.

Figure 5.2 – Blackwall Tunnel third bore concept

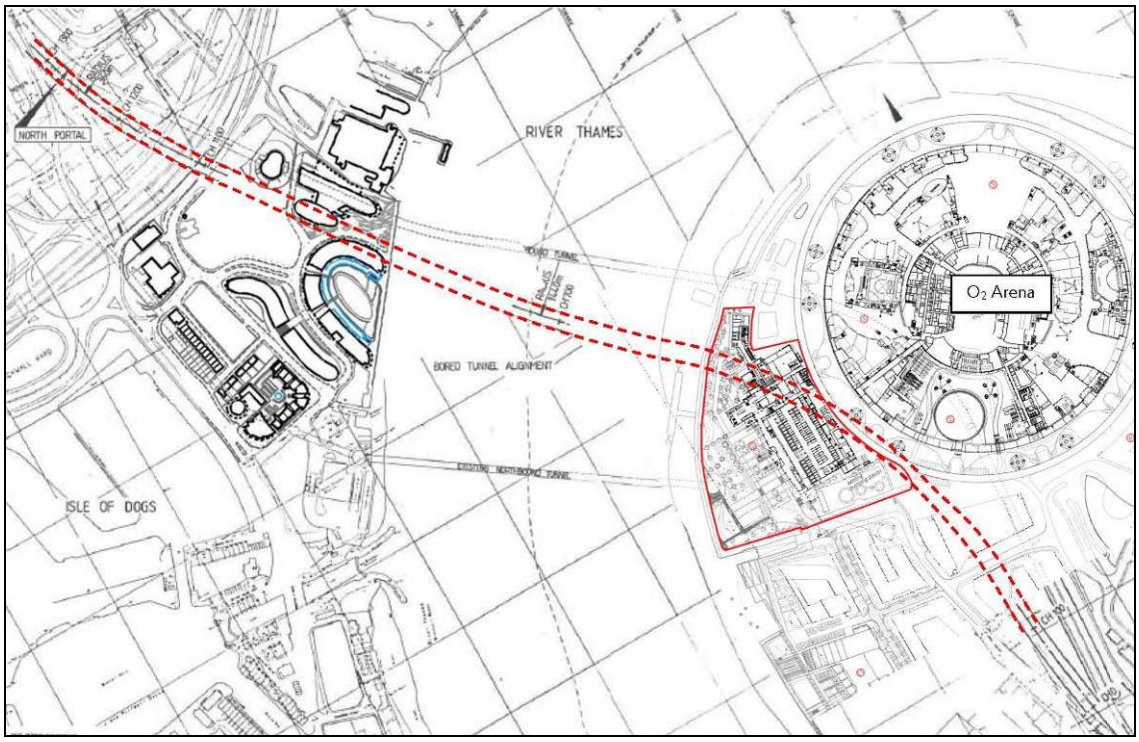


6.9. A third bore solution, however, poses several problems in terms of objectives, costs, traffic and engineering.

6.10. One major issue is that in the intervening two decades since the previous work, there has been significant development in the area, much of which has entailed construction of tall buildings with deep foundation piles which have been constructed on sites above that identified as a potential tunnel alignment.

6.11. The Figure below illustrates the 1990s concept design (outlined in red) on a plan outlining the notable new developments on both sides of the Thames which have been built in the intervening years.

Figure 5.3 – Blackwall Tunnel third bore concept with recent developments



6.12. On the north bank, the new development shown in bold is known as New Providence Wharf, and incorporates several residential and hotel buildings. The elliptical building located directly on the third bore alignment is Ontario Tower, which stands 104 metres tall. On the site shown as vacant immediately to the west, there is planning consent for the final phase of the development, to be known as Quebec Tower; this is a 136 metre residential tower.

6.13. On the south side, the O2 Arena has been built, and this is shown on the drawing. Within the red line, AEG have recently been granted consent for construction of a large hotel complex, with a tower of around 100 metres in height directly on the concept third bore alignment, and this is due to commence construction in 2013.

6.14. In the case of all of these tall buildings, the piled foundations will extend deep into the ground and compromise the construction of a tunnel. Feasibility of construction is thus uncertain, and likely to be unachievable now given tall developments since the previous concept work, and the more onerous safety requirements adopted since then. A review of the 1990s scheme for TfL concluded that construction of a third bore was not feasible.

6.15. Another issue is emergency intervention and escape. At the time of the construction of the previous tunnels, and the planning of a third bore, the form of escape through the running tunnel was deemed acceptable, but current standards require more points of intervention and escape to allow access by the emergency services and escape by tunnel occupants. This is typically achieved by provision of cross-passages to the adjacent tunnel, but this would not appear to be feasible in this case. Alternatively escape and intervention could be allowed for through provision of a separate chamber within the tunnel, potentially utilising the invert below the road

deck. However this would increase the size of the tunnel diameter, further constraining the alignment.

Option D1 – Assessment against SAF

6.16. The table below summarises the option against the Strategic Assessment Framework.

MTS Challenges	MTS Outcomes	Qualitative Score	Comments
Goal 1: Support economic development and population growth			
Supporting sustainable population and employment growth	Balancing capacity and demand for travel through increasing public transport capacity	Moderate Positive	Increased capacity on the road network, at a location where there is very high demand
	Balancing capacity and demand for travel through reducing the need to travel	Slight Negative	Assume it would not be possible to toll and therefore this scheme could encourage more journeys at peak times
Improving transport connectivity	Improving people's access to jobs	Moderate Positive	Increased capacity in the peak direction, would improve journey times and increase resiilence for people travelling across the river to work
	Improving access to commercial markets for freight movements and business travel	Slight Positive	Full bore tunnel would provide a new link for HGVs, however, it would operate in different directions at different times of day which is confusing and could create issues
Delivering an efficient and effective transport system for goods and people	Smoothing traffic flow (managing delay, improving journey time reliability and resilience)	Slight Positive	Peak demand split between two tunnels rather than one. No impact on contra-flow demand, which is already nearing existing tunnel capacity
	Improving public transport reliability	Slight Positive	Reduced congestion through tunnel and in approach roads, would marginally improve reliability on local bus routes
	Reducing operating costs	Slight Negative	Expensive scheme to build and would be difficult to implement user charging because no new link is being provided, so it would not recoup the cost
	Bringing and maintaining all assets to a state of good repair	Neutral	No impact
	Enhancing use of the Thames for people and goods	Slight Positive	Improved crossing including new link for HGVs
Goal 2: Quality of Life			
Improving journey experience	Improving public transport customer satisfaction	Neutral	No impact
	Improving road user satisfaction (drivers, pedestrians, cyclists)	Moderate Positive	Improved journey time and reduced congestion at Blackwall, although it would be tidal flows only
	Reducing public transport crowding	Neutral	No impact
Enhancing the built and natural environment	Enhancing streetscape, improving the perception of urban realm and developing 'better streets' initiatives	Neutral	Additional tunnel however it is in an area which already has heavy road infrastructure, no additional impact
	Protecting and enhancing the natural environment	Neutral	Construction impact would be contained within existing industrial land
Improving air quality	Reducing air pollutant emissions from ground based transport, contributing to EU air quality targets	Neutral	Reduced congestion would lead to reduced emissions, more traffic would lead to increased emissions, overall neutral
Improving noise impacts	Improving perceptions and reducing impacts of noise	Neutral	No impact
Improving health impacts	Facilitating an increase in walking and cycling	Neutral	No impact
Goal 3: Safety and security			
Reducing crime, fear of crime and anti-social behaviour	Reducing crime rates (and improving perceptions of personal safety and security)	Neutral	No impact
Improving road safety	Reducing the numbers of road traffic casualties	Neutral	No impact
Improving public transport safety	Reducing casualties on public transport networks	Neutral	No impact

Goal 4: Transport Opportunities			
Improving accessibility	Improving the physical accessibility of the transport system	Neutral	No impact
	Improving access to services	Neutral	No impact
Supporting regeneration and tackling deprivation	Supporting wider regeneration	Neutral	No impact
Goal 5: Climate change			
Reducing CO_2 emissions	Reducing CO_2 emissions from ground based transport, contributing to a London-wide 60% reduction by 2025	Neutral	Reduced congestion would lead to reduced emissions, more traffic would lead to increased emissions, overall neutral
Adapting for climate change	Maintaining the reliability of transport networks	Slight Positive	Additional cross river link at Blackwall would improve network resilience, however the additional tunnel would be tidal only
Goal 6: Support delivery of the London 2012 Olympic and Paralympics Games and its legacy			
Developing and implementing a viable and sustainable legacy for the 2012 Games	Supporting regeneration and convergence of social and economic outcomes between the five Olympic boroughs and the rest of London	Neutral	No impact
	Physical transport legacy	Neutral	No impact
	Behavioural transport legacy	Neutral	No impact

Deliverability and Risks		**Option 7**	
		Third Blackwall bore	
Issue	**Assessment Criteria**		
Deliverability and Acceptability Risks	Engineering feasibility risk	High	Engineering consultants have said it would not be possible to build, given the built environment on both sides of the river
	Complexity of delivery (risk)	Medium	Would impact on local development, existing users, etc
	Consent risk	Medium	Powers would be required
	Funding risk	High	No funding secured
	Stakeholder acceptability risk	High	Would be difficult to put on a toll as not a new link, so not acceptable for TfL
	Public acceptability risk	Medium	Disruptive during construction
	Overall deliverability risk	High	
Complexity of operation	Operational feasibility risk	High	Tidal tunnel would be operationally complex and require more traffic management
Value for Money	Benefit Cost Ratio	Unknown	Not quantified
Affordability and Financial Sustainability	CAPEX	£200m < £500m	One tunnel, so assume cheaper than Silvertown
	OPEX per annum	£1m < £2m	One additional bore would be managed as part of the existing tunnel
	Revenue implications per annum		Assume no toll, so no revenue
	Funding potential within TfL budget	Low	No funding
	Funding potential with private finance, e.g. via S106, securitisation of revenue, and DfT	Low	No positive impact on development, so no possibility to secure funding
Timescales	Timescale for delivering the changes	Long-term	
	Program risk	High	

Option D1 – Assessment against programme objectives

Option D1 – improving the efficiency of the highway network

Peak congestion at Blackwall

6.17. A new bore could be used in one of two ways:

(i) As an additional bore, to add capacity;

(ii) To replace the existing substandard northbound bore.

6.18. A new bore could not operate as a two-way tunnel without very significant additional costs in terms of providing a hard barrier between opposing movements, widening to provide room for vehicles to pass a stationary vehicle, etc. It would also impose considerable challenges in terms of emergency escape/intervention, and ventilation/heat and smoke extraction in the event of a fire.

6.19. Therefore if the bore is additional to the current northbound tunnel, it is likely to have to operate in one direction only, perhaps tidally (northbound in the morning, southbound in the evening). This is the assumption made for this option in the rest of this section.

6.20. The traffic benefits are likely to be patchy, with the new capacity operating on a tidal basis; thus the capacity in one direction is likely to be double the other. The contra-peak direction already reaches capacity at the height of the peak; with significant local growth, congestion in the contra-peak direction may shortly become an issue, as could congestion downstream of the tunnel in the peak direction. (A previous scheme to operate the Blackwall tunnel tidally in the peak became very problematic over time, partly due to safety concerns, but also because the counter-peak flows increased greatly over time; southbound delays and queues in the morning peak became as problematic as in the northbound peak direction.)

6.21. User charging could be used to manage this growth, but may be difficult to implement with no changes in connectivity, and benefits only accruing to users in the peak direction, as it would duplicate the current crossing which operates within capacity in most off-peak periods.

Crossing resilience and network reliability

6.22. Operating tidally (northbound in the morning, southbound in the evening) would result in different vehicle restrictions at different times of day (e.g. vehicles over 4 metres high only when the new tunnel is operating northbound) and is likely to present a complex message to users. There is a high potential for overheight drivers to arrive and cause difficulties when the new tunnel is running southbound and they are unable to use the Blackwall tunnel.

6.23. Replacing the small diameter northbound tunnel with a full gauge tunnel has great potential to address the reliability issues which currently affect the northbound tunnel. However, some incidents will inevitably occur (e.g. breakdowns not directly related to the tunnel itself) and in these circumstances there would be no means of diverting Blackwall users to another tunnel.

Journey times

6.24. Journey times at Blackwall in the peak direction would be cut significantly if the crossing capacity were to double in the peak direction. However there would be the potential for more congestion on the wider road network, which would not be increased accordingly. The extent of this congestion will depend on whether a charging regime was applied.

Option D1 – supporting the public transport network

6.25. A new tunnel at this location would provide little additional public transport utility, although it should improve the reliability of local bus services by addressing the highest levels of peak congestion.

Option D1 – integrating with land use policies

6.26. The regeneration impact would be fairly limited under this option, with no new connectivity provided, and congestion benefits fairly small or unevenly spread. However the Blackwall tunnel would be more reliable with a new full gauge bore.

6.27. There is a very considerable conflict between the most recently designed tunnel alignment and large developments with deep piled foundations which have been built or consented along this route. In reality, it is not plausible to have an impact on these developments, and therefore the tunnel design would need to take account of these developments and use an alternative alignment. It is the view of engineering consultants that it would not be feasible to find such an alignment.

Option D1 – impacts on health, safety and the environment

6.28. The scheme would lead to less congestion and better resilience, however the environmental benefits would be marginal and when offset against the construction impacts there is considered to be a neutral impact upon the environment.

Option D1 – borough and other stakeholder views

6.29. Stakeholder views on this option have not been sought given the engineering feasibility is unclear and the benefits would not appear to outweigh the costs.

Option D1 – achieving value for money

6.30. No engineering study has been undertaken, so the costs are difficult to quantify; the many physical constraints will influence the construction cost considerably, and there are questions about the design and operation of the tunnel which would need to be resolved before any cost estimates could be undertaken. It is clear however that compared with other options, this would be a very high cost option relative to the transport and regeneration benefits.

6.31. User charging at the Blackwall tunnel would almost certainly be needed to provide a source of revenue to contribute towards the costs of construction; it would also help

to manage the growth in demand which would otherwise occur if the peak period delays are eliminated by the provision of new capacity.

Option D1 – Programme objective summary

6.32. The table below summarises the option of a third Blackwall tunnel bore against the programme objectives.

		D1. Blackwall 3rd bore
To improve the efficiency of the highway network in the London Thames Gateway, especially at river crossings, and provide greater resilience for all transport users	Peak Blackwall congestion	Moderate Positive
	Blackwall crossing resilience	Slight Positive
	Connectivity east of Greenwich	NA
	Approach road independence	Moderate Negative
	Local road reliability (Greenwich)	Slight Negative
	Local road reliability (Woolwich)	Slight Positive
To support the needs of existing businesses in the area and to encourage new business investment	Local road reliability (Bexley)	Slight Positive
	Local road reliability (Royal Docks)	Slight Positive
	JTs across sub-region (peak)	Slight Positive
	JTs across sub-region (off-peak)	Neutral
To support the provision of public transport services in the London Thames Gateway	Reliability of local buses	Slight Positive
	Allows new orbital public transport	Neutral
	Mode shift potential, car to public	Neutral
To integrate with local and strategic land use policies	Lower Lea Valley OA	Neutral
	Greenwich Peninsula OA	Slight Positive
	Royal Docks OA	Neutral
	London Riverside OA	Neutral
	Bexley Riverside OA	Neutral
	Thamesmead & Abbey Wood OA	Neutral
	Woolwich OA	Neutral
	Charlton Riverside OA	Neutral
To minimise the impacts of any proposals on health, safety and the environment	Health	Neutral
	Safety	Neutral
	Environment	Neutral
To ensure where possible that any proposals are acceptable in principle to key stakeholders, including affected boroughs	Local boroughs	Neutral
	Other stakeholders	Neutral
To achieve value for money	Business case	Slight Negative
	Wider economic benefits	Neutral
	Low cost for users	Slight Negative
	CIL funding potential	Neutral
	Potential for user revenue to offset	Slight Positive
	Capital cost	Moderate Negative

Assessment of Option D1 (Third Blackwall bore) – conclusion

6.33. Under Option D1, a third tunnel would be bored at Blackwall to supplement the existing tunnels.

6.34. This option has been assessed against the MTS goals and outcomes using SAF and the specific programme objectives.

Goal 1 – support economic development and population growth

6.35. The option performs positively overall against this goal, with the new tunnel providing additional capacity at this key bottleneck.

Goal 2 – quality of life

6.36. The option performs slightly positively overall against this goal, with higher driver satisfaction likely if the current queues are addressed by the new tunnel.

Goal 3 – safety and security

6.37. The option performs neutrally overall against this goal.

Goal 4 – transport opportunities

6.38. The option performs neutrally overall against this goal.

Goal 5 – climate change

6.39. The option has a slightly positive overall effect against this goal, with increased network resilience with a third tunnel available to carry Blackwall traffic.

Goal 6 – support delivery of the London 2012 Olympic and Paralympic Games and its legacy

6.40. The option performs neutrally overall against this goal.

Programme objectives

6.41. This option could help to meet some of the key MTS and scheme objectives, in particular addressing the particular peak congestion problem and local network reliability. However, operationally it would be very difficult to manage a tidal tunnel, especially given high demand in both directions and differing height limits on the tunnels. It would provide either no new capacity (if replacing the northbound bore) or very unbalanced new capacity if operated tidally.

6.42. Feasibility of construction is very uncertain, and likely to be unachievable now given tall developments since the previous concept work, and the more onerous safety requirements adopted since then.

6.43. Given the serious doubts around feasibility, and the failure of this option to meet the objectives, **it is not recommended for further work**.

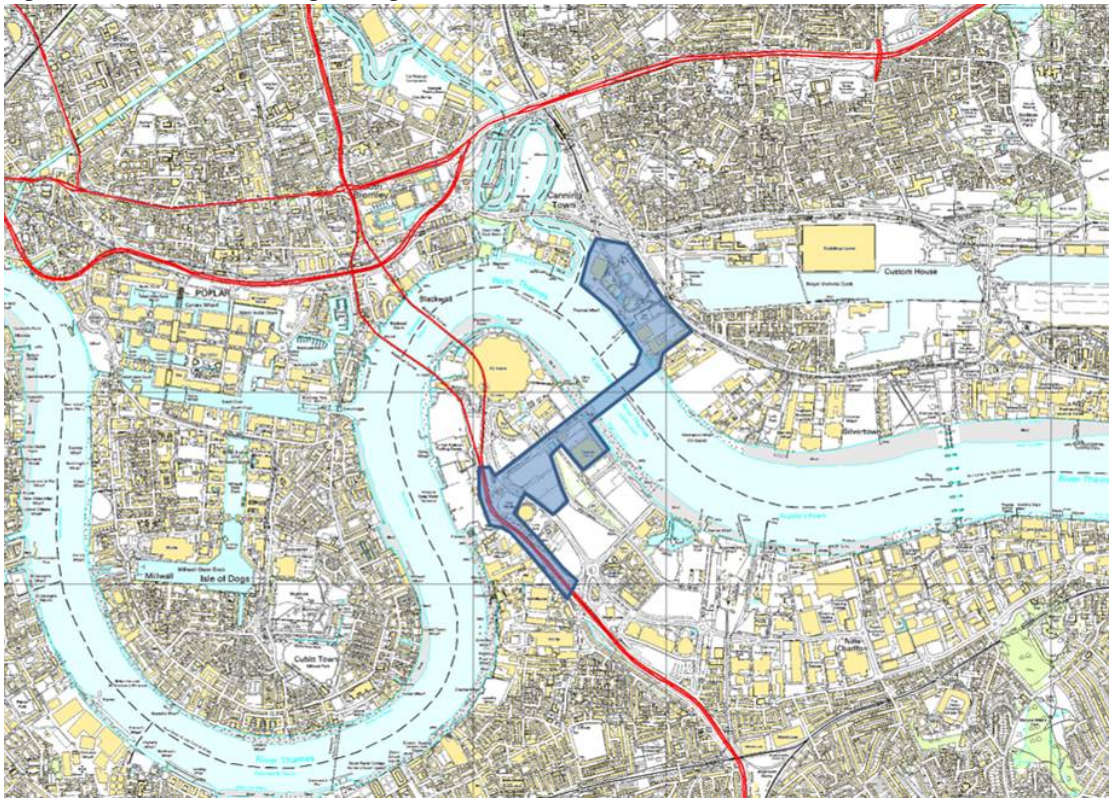
OPTION: SILVERTOWN LIFTING BRIDGE

Option D2 – Option description

6.44. While Blackwall itself presents significant construction challenges, and similar challenges in the vicinity due to a large amount of riparian development in the area over the past 25 years, an opportunity remains in the form of the Silvertown Crossing, which is close to the Blackwall Tunnel and enjoys safeguarded status, set by the Secretary of State for Transport and now managed by the Mayor of London.

6.45. This crossing point was originally safeguarded in the 1990s in a form suitable for either a bridge or tunnel; however, since safeguarding was instituted, there has been further development in the area which has major implications for the form of crossing.

Figure 5.4 – Silvertown Safeguarding area

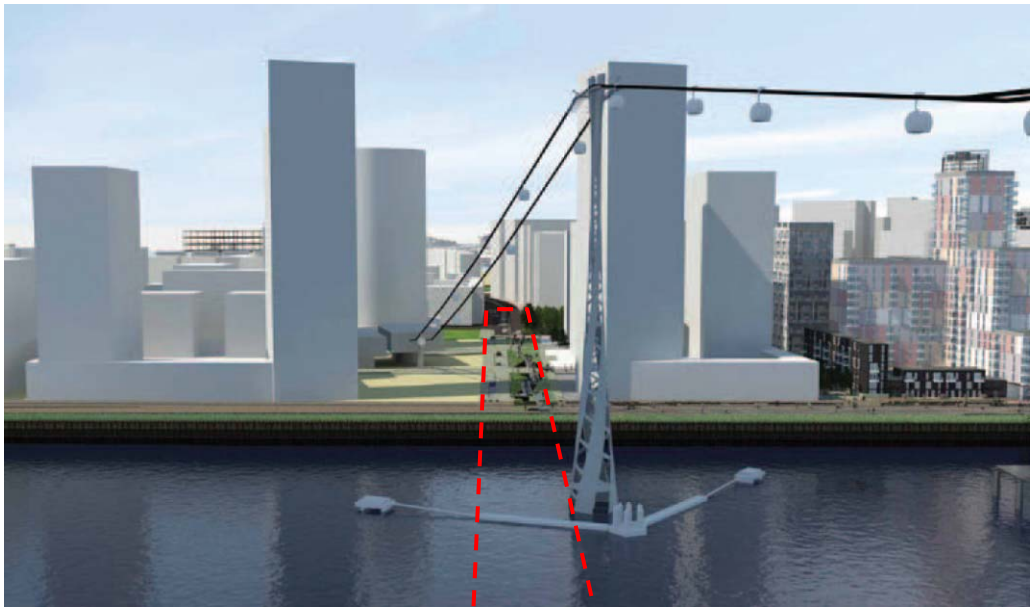


6.46. To maintain navigation on the River Thames, a bridge would need to provide a clearance to the Thames (at high water) of at least 50 metres. Given that the local topography is level, a bridge of this size would require significant approach ramps to reach this height, which is difficult to accommodate within the local constraints of highway connections, DLR line and existing residential development. Such a large structure could not tie into the local road networks as the approach viaduct would need to commence beyond the closest junctions, so connectivity to the Royal Docks and Greenwich Peninsula would be poor. It would also be incompatible with the Emirates Air Line.

6.47. An alternative would be an opening structure, with a lower road deck, reducing the length of the approach viaducts. This would allow the crossing to tie into the local road networks, but introduces a very significant problem of closures to traffic during ship passes.

6.48. The Figure below illustrates the corridor through which a bridge would pass, illustrating the dense nature of the environment through which it would pass, as well as the close proximity of the Emirates Air Line.

Figure 5.5 – Illustration of crossing alignment with consented development shown

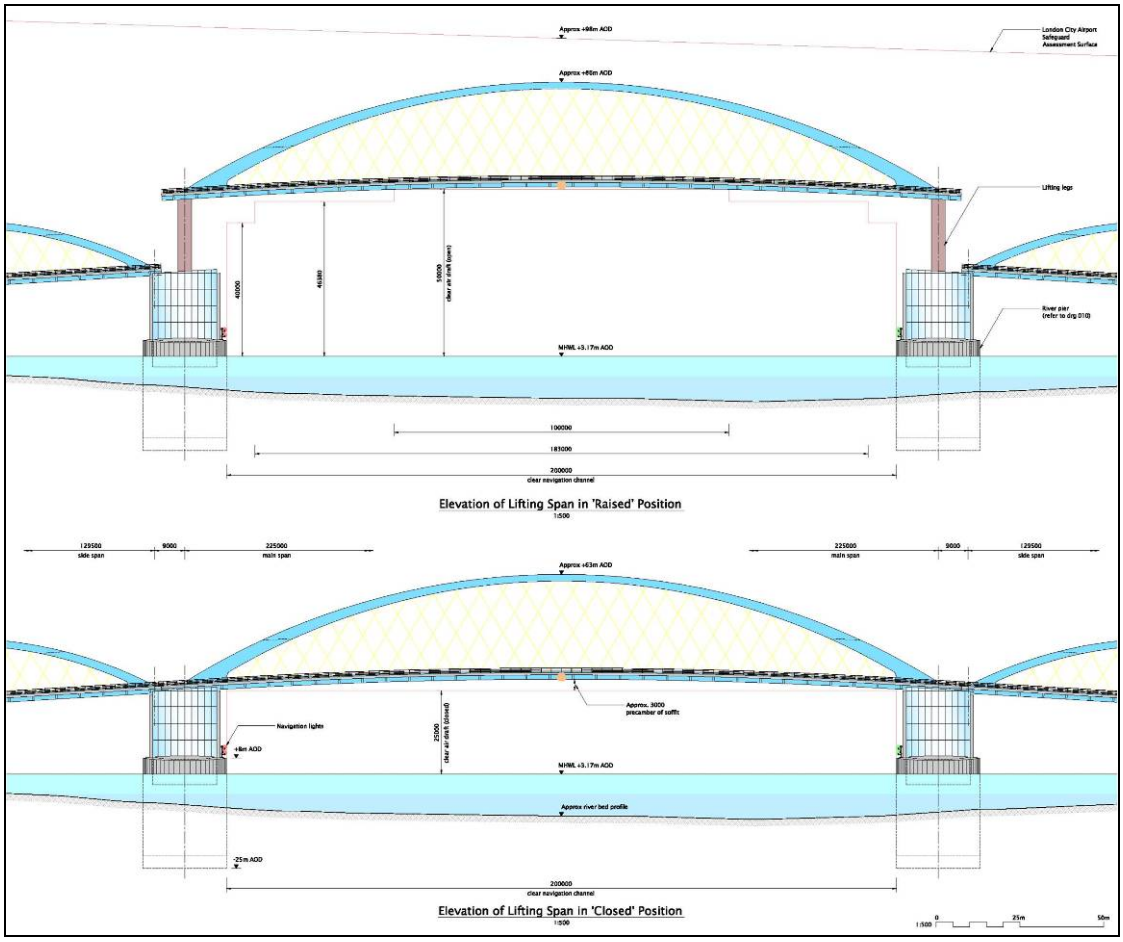


Source: Planning application for amended masterplan, Farrells

6.49. A lifting bridge with a road deck of up to 15 metres above high water may be feasible; it would have approach roads at a low level, with interfaces with roads on the on the Greenwich peninsula.

6.50. The Figure below illustrates the type of structure which could be feasible in this area, to maintain the navigability of the Thames.

Figure 5.6 – Lifting bridge concept



6.51. The clearances – horizontally and vertically – would need to be agreed with the Port of London Authority.

Option D2 – Assessment against SAF

6.52. The table below summarises the option against the Strategic Assessment Framework.

MTS Challenges	MTS Outcomes	Qualitative Score	Comments
Goal 1: Support economic development and population growth			
Supporting sustainable population and employment growth	Balancing capacity and demand for travel through increasing public transport capacity	Slight Positive	Additional river crossing for vehicles. However, it would need to open for passing ships, between 1 to 15 times a day depending on the height. Therefore would not be feasible to run buses across the bridge. Also, ship movements may coincide with peak traffic movements, and there could be a lot of congestion at certain times
	Balancing capacity and demand for travel through reducing the need to travel	Slight Positive	Toll could be used to manage peak demand - details are not yet worked through
Improving transport connectivity	Improving people's access to jobs	Slight Positive	Additional cross river link would improve access to jobs, but the link would be unreliable
	Improving access to commercial markets for freight movements and business travel	Slight Positive	Additional cross river link, suitable for HGVs, however it would be unreliable due to regular closures for shipping movements
Delivering an efficient and effective transport system for goods and people	Smoothing traffic flow (managing delay, improving journey time reliability and resilience)	Neutral	Unreliable link, so would not improve reliability
	Improving public transport reliability	Neutral	No impact
	Reducing operating costs	Slight Positive	High operating costs linked to lifting aspect of the bridge Tolls would generate revenue
	Bringing and maintaining all assets to a state of good repair	Neutral	No impact
	Enhancing use of the Thames for people and goods	Slight Positive	Additional crossing. Ship movements get priority so no negative impact on shipping
Goal 2: Quality of Life			
Improving journey experience	Improving public transport customer satisfaction	Neutral	No impact
	Improving road user satisfaction (drivers, pedestrians, cyclists)	Slight Positive	New crossing
	Reducing public transport crowding	Neutral	No impact
Enhancing the built and natural environment	Enhancing streetscape, improving the perception of urban realm and developing 'better streets' initiatives	Moderate Negative	Access roads would affect urban realm on Greenwich peninsula, which is a residential development area
	Protecting and enhancing the natural environment	Moderate Negative	Big construction impact and impact on the river
Improving air quality	Reducing air pollutant emissions from ground based transport, contributing to EU air quality targets	Moderate Negative	Increased congestion would lead to increased emissions, in a densely built up area
Improving noise impacts	Improving perceptions and reducing impacts of noise	Moderate Negative	Bridge would go through dense development area and would have noise impacts
Improving health impacts	Facilitating an increase in walking and cycling	Neutral	No impact
Goal 3: Safety and security			
Reducing crime, fear of crime and anti-social behaviour	Reducing crime rates (and improving perceptions of personal safety and security)	Neutral	No impact
Improving road safety	Reducing the numbers of road traffic casualties	Slight Positive	Full vehicle gauge crossing with modern safety features would reduce the number of large vehicles using Blackwall. This would improve safety there and put those vehicles into a safer environment, but only when the bridge is open
Improving public transport safety	Reducing casualties on public transport networks	Neutral	No impact

Goal 4: Transport Opportunities			
Improving accessibility	Improving the physical accessibility of the transport system	Neutral	No impact
	Improving access to services	Neutral	No impact (although it is a bridge, because of the lifting aspect it would not be feasible to run cross river bus services on it)
Supporting regeneration and tackling deprivation	Supporting wider regeneration	Neutral	Greenwich is an area for growth in the London Plan however this is a road scheme only and it would not be feasible to run bus services across (due to bridge opening for ships to pass)
Goal 5: Climate change			
Reducing CO_2 emissions	Reducing CO_2 emissions from ground based transport, contributing to a London-wide 60% reduction by 2025	Moderate Negative	Increased congestion wouldl lead to increased emissions, in a densely built up area
Adapting for climate change	Maintaining the reliability of transport networks	Slight Negative	Generally improves resilience but there would be severe problems on occasion if a shipping incident occurs during the peak
Goal 6: Support delivery of the London 2012 Olympic and Paralympics Games and its legacy			
Developing and implementing a viable and sustainable legacy for the 2012 Games	Supporting regeneration and convergence of social and economic outcomes between the five Olympic boroughs and the rest of London	Neutral	New cross river link in east London which would improve connectivity, however it is unreliable and there would be a toll
	Physical transport legacy	Neutral	No impact
	Behavioural transport legacy	Neutral	No impact

Deliverability and Risks		**Option 8**	
		Silvertown lifting bridge	
Issue	**Assessment Criteria**		
Deliverability and Acceptability Risks	Engineering feasibility risk	High	Difficult to build a bridge through dense area with tall buildings, also engineering a lifting bridge
	Complexity of delivery (risk)	High	Lifting bridge and dense area makes this complex, PLA would need to be involved
	Consent risk	High	Powers required, likely objections from RB Greenwich (contrary to their planning policy), and PLA (impact on river)
	Funding risk	High	No funding secured
	Stakeholder acceptability risk	High	Contrary to RB Greenwich planning policy and conflict with development
	Public acceptability risk	High	Big visual and noise impact on dense development area including residential
	Overall deliverability risk	High	
Complexity of operation	Operational feasibility risk	High	Lifting bridge would require additional mechanical and operational staff, would make river operations more complex, and would make traffic management more difficult
Value for Money	Benefit Cost Ratio	Unknown	Not quantified
Affordability and Financial Sustainability	CAPEX	£200m < £500m	Expect to be slightly cheaper than a tunnel
	OPEX per annum	£2m < £5m	Lifting bridge is a mechanical aspect, with ongoing costs
	Revenue implications per annum	> £50m	Assume toll at Blackwall
	Funding potential within TfL budget	Low	No funding
	Funding potential with private finance, e.g. via S106, securitisation of revenue, and DfT	Low	Negative impact on development, no possibility to secure funding
Timescales	Timescale for delivering the changes	Long-term	
	Program risk	High	

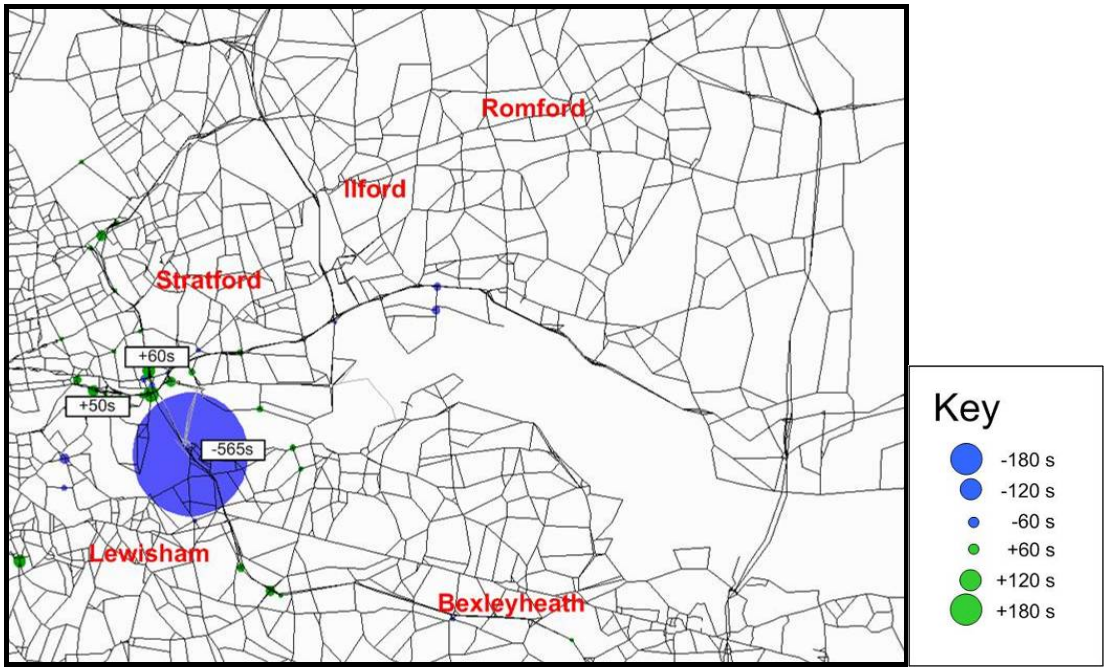
Option D2 – Assessment against programme objectives

Option D2 – improving the efficiency of the highway network

Peak congestion

6.53. A bridge at this location would significantly reduce congestion at the Blackwall tunnel, by providing another high capacity crossing adjacent to it, *during the periods it is open to traffic*. The Figure below illustrates the potential changes in highway delay at nodes in the morning peak following the construction of the Silvertown crossing, assuming the crossing is open to vehicle traffic.

Figure 5.7 – Forecast changes in average junction delay with the Silvertown crossing, morning peak, 2021 (s=second)



Source: TfL's East London Highway Assignment Model (ELHAM)

6.54. The extent of this relief, and the extent of any wider congestion issues, will depend on whether a user charging regime was applied. If the new crossing were not charged, then widespread congestion in the area is forecast, with the crossing resulting in much higher volumes of traffic in the surrounding area, which is already subject to congestion not directly related to Blackwall; currently the demand to cross at Blackwall in the peak direction is around 50% higher than the capacity of the tunnel.

6.55. However the reliability of this link would be a major issue; closures to traffic to accommodate shipping (discussed in more detail in the next section) would occur at any time of day depending on tides; closures coinciding with any busy period (the peaks especially) would lead to a major drop in capacity across the pair of crossings (Blackwall/Silvertown) and would greatly exacerbate congestion.

Crossing resilience and network reliability

6.56. There are four major ship moorings upstream of the Silvertown crossing:

(i) West India Dock

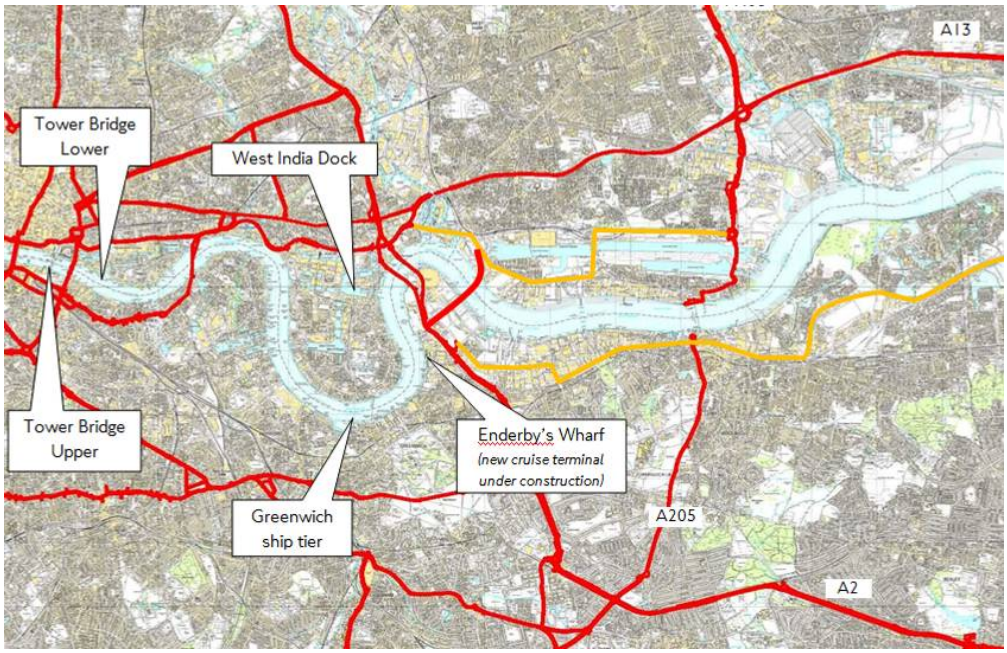
(ii) Greenwich ship tier

(iii) Tower Bridge Lower

(iv) Tower Bridge Upper

6.57. In addition, a new cruise terminal at Enderby's Wharf has been granted planning permission; this will be able to cater for large ships up to 240 metres in length (currently the Greenwich ship tier is the largest in this part of the Thames and can cater for ships up to 208 metres in length).

Figure 5.8 – large ship moorings upstream of Silvertown



6.58. As well as the cruise ships, there are some commercial ships using this part of the river. There are several safeguarded wharves upstream of Silvertown where commercial shipping is still active, including the Victoria deep wharf on the western side of the Greenwich peninsula. Others such as Convoys Wharf in Deptford have traditionally handled high volumes of shipping; while it is currently idle, the wharf is safeguarded and is likely to come back into use.

6.59. Finally the river is still frequently visited by a range of other vessels including sailing ships; while not very large, these have masts which would impact upon a lifting bridge.

6.60. As a result of this shipping activity, a lifting/opening bridge would be regularly opening to shipping and closing to traffic. The frequency would depend on the exact height of the bridge deck, and variations in the use of the river wharves; for example, the re-

establishment of the safeguarded Convoys Wharf could reintroduce a large number of ship movements.

6.61. A review of shipping data suggests that the bridge would need to open for a large number of vessels including sailing yachts, tugs, hopper barges, aggregate dredgers and larger bulk vessels. It is calculated that there would be 10-15 vessels a day that would require the bridge to be opened.

6.62. Ship entries into and exits from the Thames are dependent on the tides, with large ships generally entering the Thames on an incoming tide, and exiting on a receding tide. It is therefore difficult to regulate the timing of ship movements.

6.63. A lifting bridge at Silvertown would therefore regularly close to traffic at times that the crossings are operating close to capacity, when the Blackwall tunnel is unable to accommodate the combined flow of traffic attempting to cross in this area. Large vehicles unable to use Blackwall, but capable of using Silvertown, would be unable to cross the Thames for the period of the closure, and would need to park and wait a considerable time for the crossing to be reopened, or would have to divert to an alternative crossing.

6.64. To ensure the safety of the structure, it will be necessary for procedures to be adopted to ensure that the bridge is ready for a large ship to pass before the ship has passed its last possible abort location. If too short a time is allowed, any possible failure to open the bridge for shipping – such as due to a mechanical failure, the presence of traffic or broken down vehicles on the bridge, or by pedestrians failing to clear the bridge – could result in a collision. Therefore, ships will need to be able to either abort their passage at a suitable location, or not leave their Thames moorings, when the bridge closes to traffic and pedestrians.

6.65. Preliminary work suggests a closure duration in excess of 20 minutes to allow for both mechanical procedures and time for large ships to pass. By comparison, Tower Bridge lifts can be completed within five minutes, because it is almost adjacent to the final moorings and therefore does not need to cater for ships already in transit on the river's tide.

6.66. As such the crossing would provide a poor level of reliability, with regular disruptions to traffic resulting in severe congestion in the areas on either side of the river, and diversion of tall vehicles to other crossings such as Dartford (due to the low headroom of the Blackwall tunnel).

Journey times

6.67. Journey times in the peak direction would be greatly reduced under this option when the crossing is open to traffic, with more than 50% additional capacity over the river in this area. (In theory up to 100% additional capacity could be provided if both lanes are used by general traffic, although one lane could be allocated to priority vehicles, such as buses and goods vehicles). Peak period delays for current Blackwall tunnel users of around 20 minutes are likely to be effectively eliminated, while cross-river journeys to the areas best served by the new crossing, such as the Royal Docks, will save several minutes at any time of day.

6.68. However, journey times would be severely impacted by closures at busy times of day, with a high degree of unreliability in the journey times in the area.

Option D2 – supporting the public transport network

6.69. It would not be practical to route bus services over a bridge with frequent and long closures to traffic. The effect of queues during ship passes would have a major impact on the wider road network in the Royal Docks, East India and Greenwich peninsula areas. While there is some bus priority in these areas, there would almost certainly be an impact on the reliability of local bus services.

Option D2 – integrating with land use policies

6.70. The Greenwich Peninsula is designated an Opportunity Area in the London Plan. It is described thus:

> *"The Peninsula plays **two key strategic roles**, as an **internationally significant leisure attraction** and as a **major contributor to meeting London's need for additional housing**. The main focus of commercial development is at the north of the peninsula around the O2 Centre and the Jubilee Line station. Any release of industrial capacity should be managed in a sub-regional context and as part of the planning framework, recognising the roles of safeguarded wharves and the potential for a cruise liner terminal. River paths, parks and squares on the peninsula should contribute to a **high quality public realm** and become part of the wider East London Green Grid with potential to improve pedestrian and cycle linkages from the O2 to Greenwich town centre. Development and infrastructure provision should be co-ordinated with that in neighbouring Charlton Riverside."*

6.71. The London Plan sets a target of a minimum of 13,500 new homes on the peninsula.

6.72. The peninsula is also designated in the London Plan as a Strategic Cultural Area, and as a strategic cluster of night time activity of regional/sub-regional importance.

6.73. Key to delivering the London Plan's ambitions for the peninsula is the development of a high quality public realm, to support the attractiveness of the area as a place to visit and as a place to live.

6.74. The concept of the Silvertown crossing dates to a period in which the area was still occupied by heavy industry; the current safeguarding was put in place in the 1990s, when much of the land affected was derelict British Gas land.

6.75. Since then, there have been profound changes on the peninsula; the Jubilee line has been extended to the area; the Millennium Dome has been built and then transformed into the O2 Arena and entertainment complex; the beginnings of a town centre have been built with shops, offices and a college around Millennium Square; construction of housing is under way; and the Emirates Air Line provides a link to the complementary visitor attractions in the Royal Docks.

6.76. The peninsula masterplan was approved by RB Greenwich and the Mayor of London in 2004 and covers the northern and eastern parts of the peninsula, including the area alongside the Silvertown Crossing.

6.77. If the Silvertown crossing was to be taken forward as a bridge, it would require the construction of a large viaduct carrying the elevated highway across the peninsula, thought the heart of the new urban centre. Alternatively, a major highway would be built at ground level, conflicting with local movement for pedestrians, buses and local traffic.

6.78. Figure 5.5 below illustrates the current approved masterplan, and indicates the alignment of the Silvertown crossing within the masterplan area.

Figure 5.9 – Greenwich Peninsula masterplan, Silvertown Crossing route outlined in red

6.79. It is apparent that the construction of an elevated highway through the heart of the area would be incompatible with the London Plan's vision for the area, and the consented plans for dense development along the corridor. A ground-level access

road would have a major severance effect on local movement across the road, including high volumes of pedestrians and buses as well as local access traffic. If the road is at ground level, the impacts on local movement during closures for shipping would be very significant, with likely congestion and rat-running around the peninsula to avoid queues.

Option D2 – impacts on health, safety and the environment

6.80. A bridge at Silvertown would have an impact on the river due to the piers; there would also be a visual impact. A lifting bridge would also create queuing whilst vehicles waiting for the bridge to lower, which would have a local noise and air quality impact in a residential area. Some of the impact would be offset against general congestion relief, although there is likely to remain a net adverse impact.

6.81. When operating normally it would reduce the volumes of large vehicles using the Blackwall tunnel, which would improve the safety of the Blackwall and putting these vehicles into a safer environment than the current tunnels. However, bridge closures would result in these vehicles re-routing to the Blackwall tunnel. As this would be more likely to include vehicles over 4 metres in height (which could use a bridge but not the Blackwall tunnel northbound) there is a high risk of incidents at Blackwall during closures of the bridge. Overall therefore the safety effects are likely to be neutral.

Option D2 – borough and other stakeholder views

6.82. As a result of the impacts on the Greenwich peninsula of the approach roads, the stakeholders responsible for delivering the planned regeneration of the peninsula are strongly opposed to the construction of an elevated highway through the area, or at-grade junctions which allow crossing traffic to use roads built for the distribution of residential access traffic. The Royal Borough of Greenwich's adopted UDP (2006)[3] states that:

"Should this crossing proceed the Council will require a tunnel, not a bridge."

Option D2 – achieving value for money

6.83. In 2009 Mott MacDonald estimated the cost of a lifting bridge at this location, at the same time as estimating a bored tunnel. The bridge option was estimated to cost around £80 million less than the bored tunnel option (excluding risk); however, there would be some additional costs associated with a bridge which are excluded from this estimate, including costs associated with handling the environmental and navigational impacts in the river, and the provision of a new radar site to replace the current PLA radar on the eastern side of the Greenwich peninsula. There would also be higher land costs compared with a tunnel option.

[3] http://www.royalgreenwich.gov.uk/download/downloads/id/752/unitary_development_plan_2006

6.84. User charging at the new tunnel would almost certainly be needed to provide a source of revenue to contribute towards the costs of construction; it would also help to manage the growth in demand which would otherwise occur if the peak period delays are eliminated by the provision of new capacity. Given the proximity of the Blackwall tunnel, that crossing would also need to be included within any charging regime, which would be a new cost imposed on users. Some will benefit overall from the reduced journey times when weighed against the cost, but some users may incur a charge without gaining a journey time advantage.

6.85. However users of both crossings would suffer from poor reliability in journey times, with regular interruptions to traffic flow whenever ships are passing, and the benefits of the crossing would be much lower compared with a more resilient tunnel option.

Option D2 – Programme objective summary

6.86. The table below summarises the Silvertown lifting bridge option against the programme objectives.

		D2. Silvertown lifting bridge
To improve the efficiency of the highway network in the London Thames Gateway, especially at river crossings, and provide greater resilience for all transport users	Peak Blackwall congestion	Moderate Positive
	Blackwall crossing resilience	Slight Positive
	Connectivity east of Greenwich	NA
	Approach road independence	Slight Negative
	Local road reliability (Greenwich)	Strong Negative
	Local road reliability (Woolwich)	Neutral
To support the needs of existing businesses in the area and to encourage new business investment	Local road reliability (Bexley)	Neutral
	Local road reliability (Royal Docks)	Moderate Negative
	JTs across sub-region (peak)	Slight Positive
	JTs across sub-region (off-peak)	Neutral
To support the provision of public transport services in the London Thames Gateway	Reliability of local buses	Slight Negative
	Allows new orbital public transport	Neutral
	Mode shift potential, car to public	Neutral
To integrate with local and strategic land use policies	Lower Lea Valley OA	Neutral
	Greenwich Peninsula OA	Strong Negative
	Royal Docks OA	Slight Negative
	London Riverside OA	Neutral
	Bexley Riverside OA	Neutral
	Thamesmead & Abbey Wood OA	Neutral
	Woolwich OA	Neutral
	Charlton Riverside OA	Neutral
To minimise the impacts of any proposals on health, safety and the environment	Health	Neutral
	Safety	Neutral
	Environment	Slight Negative
To ensure where possible that any proposals are acceptable in principle to key stakeholders, including affected boroughs	Local boroughs	Slight Negative
	Other stakeholders	Moderate Negative
To achieve value for money	Business case	Slight Positive
	Wider economic benefits	Neutral
	Low cost for users	Moderate Negative
	CIL funding potential	Neutral
	Potential for user revenue to offset	Moderate Positive
	Capital cost	Moderate Negative

Assessment of Option D2 (Silvertown bridge) – conclusion

6.87. Under Option D2, a lifting bridge would be built at Silvertown.

6.88. This option has been assessed against the MTS goals and outcomes using SAF and the specific programme objectives.

Goal 1 – support economic development and population growth

6.89. The option performs positively against this goal, with the new tunnel providing additional capacity at this key bottleneck.

Goal 2 – quality of life

6.90. The option performs negatively against this goal, with an elevated highway having a negative effect on the planned residential community immediately adjacent to the route on the Greenwich peninsula.

Goal 3 – safety and security

6.91. The option performs positively against this goal, with the new crossing providing a full vehicle gauge route as an alternative to the Blackwall tunnel.

Goal 4 – transport opportunities

6.92. The option performs neutrally overall against this goal.

Goal 5 – climate change

6.93. The option performs negatively against this goal, with closures of the road caused by shipping movements leading to an unreliable road network and poor network resilience.

Goal 6 – support delivery of the London 2012 Olympic and Paralympic Games and its legacy

6.94. The option performs neutrally overall against this goal.

Programme objectives

6.95. A bridge would not be compatible with the London Plan's vision for the Greenwich Peninsula, and would be directly contrary to the local planning policy of RB Greenwich, which states that the Council would require the Silvertown crossing to be built as a tunnel, not a bridge. A bridge option would have a severe impact upon the development potential of the land surrounding the crossing, which since the original line of route was established has become a major development site, with dense housing units surrounding the line of route.

6.96. To accommodate shipping, a bridge would need to be an opening bridge, which closes to traffic when large ships pass; this would occur regularly, for long durations, at times determined by the tides. As such the crossing would provide a very poor level of reliability, resulting in regular severe congestion in the areas on either side of the river.

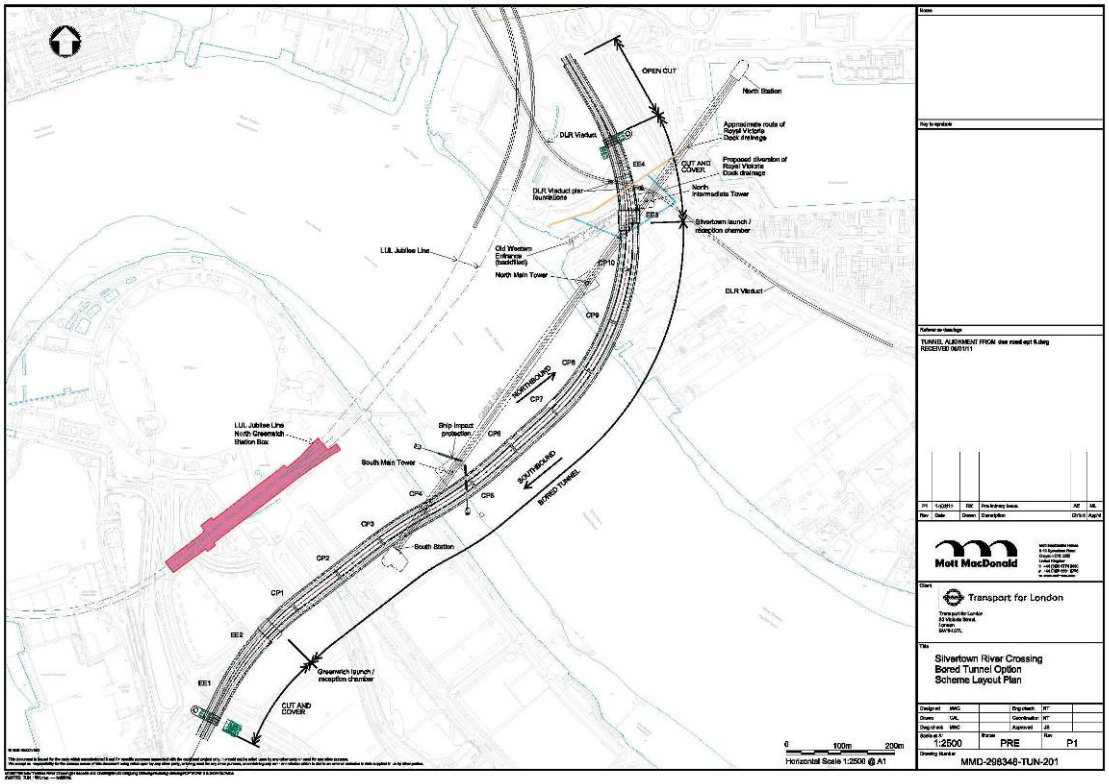
6.97. **A bridge at Silvertown is therefore not recommended for further consideration** due to its contradiction with the London Plan and borough's policy aspirations for the development of the Greenwich peninsula, and its inability to provide a reliable and robust and reliable link in the highway network.

OPTION D3: SILVERTOWN BORED TUNNEL

Option D3 – Option description

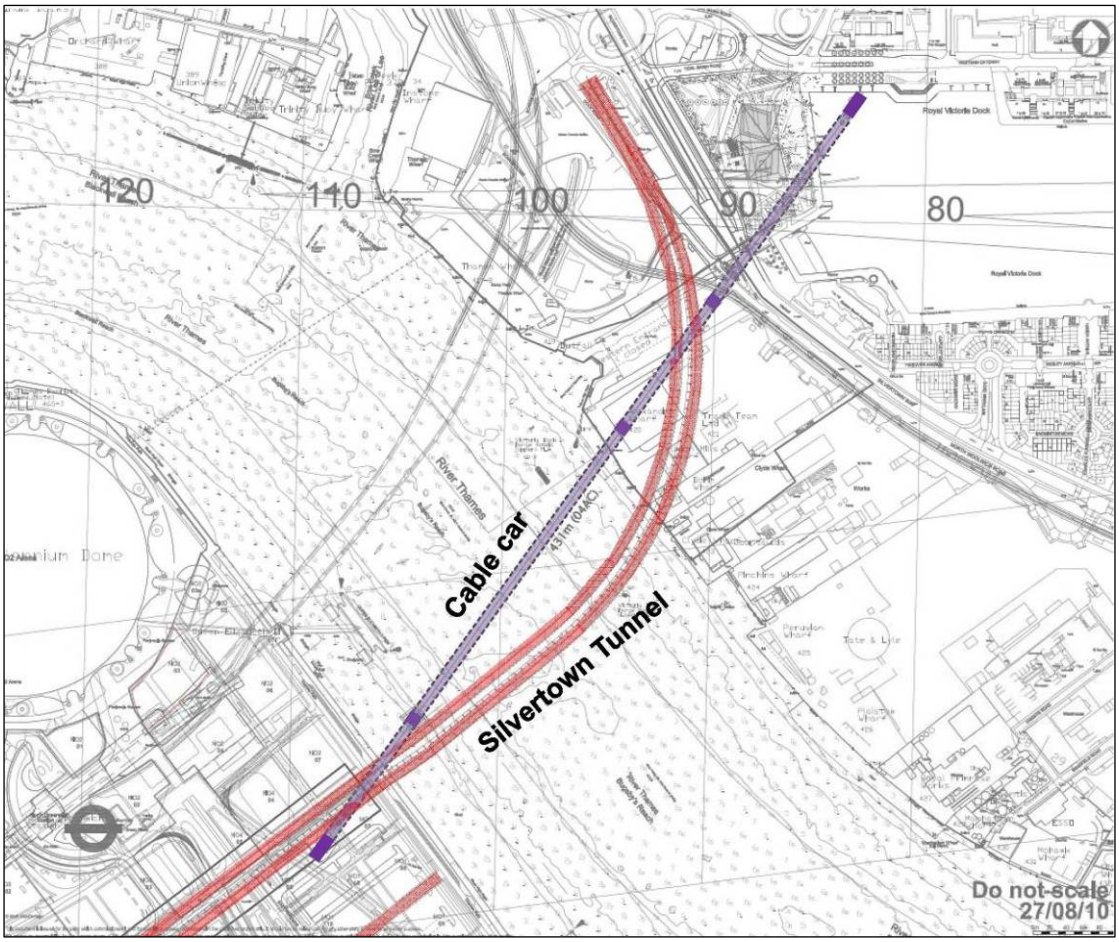
6.98. A tunnel at Silvertown could be constructed as a bored tunnel, following the safeguarded alignment but running below the main development sites which would have been affected by a bridge option. The bored tunnel option would require some excavation for cut and cover tunnels where the tunnel depth is shallow, with twin bored tunnels dug between the two portals.

Figure 5.10 – Silvertown tunnel as a bored tunnel



6.99. On the north side, it would involve a cut and cover section close to the cable car's North Intermediate Tower. The tower has been designed such that the construction of a cut and cover section close to it can be accommodated.

Figure 5.11 – Silvertown tunnel and cable car schemes



6.100. On the south side, the tunnel would pass between the South Main Tower (located in the foreshore of the River Thames) and the south station.

6.101. The bored tunnel can be accommodated in proximity to both structures, with the cable car tower design taking into account the need to protect the cable car structures from future tunnelling works.

Option D3 – Assessment against SAF

6.102. The table below summarises the option against the Strategic Assessment Framework.

MTS Challenges	MTS Outcomes	Qualitative Score	Comments
Goal 1: Support economic development and population growth			
Supporting sustainable population and employment growth	Balancing capacity and demand for travel through increasing public transport capacity	Moderate Positive	Additional river crossing for vehicles, also it enables new cross river bus links
	Balancing capacity and demand for travel through reducing the need to travel	Slight Positive	Toll can be used to manage peak demand - details are not yet worked through
Improving transport connectivity	Improving people's access to jobs	Moderate Positive	Additional cross river link would improve access to jobs
	Improving access to commercial markets for freight movements and business travel	Strong Positive	Additional cross river link, suitable for HGVs, provides a new route for freight movements
Delivering an efficient and effective transport system for goods and people	Smoothing traffic flow (managing delay, improving journey time reliability and resilience)	Moderate Positive	Two road river crossings in similar location, would greatly improve users journey time and the reliability / resilience of the network. However the shared approach road on southern side means that an incident on the A102 could affect both tunnels
	Improving public transport reliability	Moderate Positive	Reduced congestion would improve reliability of local bus routes, also the tunnel provides a suitable diversion for route 108 when Blackwall tunnel is closed
	Reducing operating costs	Moderate Positive	Operating costs would be offset by revenues from the toll on both crossings
	Bringing and maintaining all assets to a state of good repair	Slight Positive	Provides a suitable diversion route during closures of the Blackwall tunnel, including maintanence closures. This would improve the maintanence system of both tunnels
	Enhancing use of the Thames for people and goods	Strong Positive	Additional river crossing for vehicles, also it enables new cross river bus links
Goal 2: Quality of Life			
Improving journey experience	Improving public transport customer satisfaction	Slight Positive	Potential for improvements to local cross river bus connectivity
	Improving road user satisfaction (drivers, pedestrians, cyclists)	Moderate Positive	Improved journey time and reduced congestion at Blackwall, however, there would be a toll
	Reducing public transport crowding	Neutral	No impact
Enhancing the built and natural environment	Enhancing streetscape, improving the perception of urban realm and developing 'better streets' initiatives	Neutral	Impact would be in an industrial area, not affecting urban realm
	Protecting and enhancing the natural environment	Neutral	Under the river bed, minimal impact
Improving air quality	Reducing air pollutant emissions from ground based transport, contributing to EU air quality targets	Slight Positive	Reduced congestion and more resilient crossing would lead to reduced emissions, but tolling strategy would determine overall traffic volumes and therefore the wider congestion effect
Improving noise impacts	Improving perceptions and reducing impacts of noise	Neutral	No impact
Improving health impacts	Facilitating an increase in walking and cycling	Neutral	No impact
Goal 3: Safety and security			
Reducing crime, fear of crime and anti-social behaviour	Reducing crime rates (and improving perceptions of personal safety and security)	Neutral	No impact
Improving road safety	Reducing the numbers of road traffic casualties	Slight Positive	Full vehicle gauge crossing with modern safety features, would reduce the number of large vehicles using Blackwall. This would improve safety there and put those vehicles into a safer environment
Improving public transport safety	Reducing casualties on public transport networks	Neutral	No impact

Goal 4: Transport Opportunities			
Improving accessibility	Improving the physical accessibility of the transport system	Neutral	No impact
	Improving access to services	Slight Positive	Opportunity for local cross river bus links to go through the tunnel, improving access to local services on both sides of the river
Supporting regeneration and tackling deprivation	Supporting wider regeneration	Slight Positive	Opportunity for new bus links in growth area
Goal 5: Climate change			
Reducing CO_2 emissions	Reducing CO_2 emissions from ground based transport, contributing to a London-wide 60% reduction by 2025	Slight Positive	Reduced congestion and more resilient crossing would lead to reduced emissions, but tolling strategy would determine overall traffic volumes and therefore the wider congestion effect
Adapting for climate change	Maintaining the reliability of transport networks	Moderate Positive	Additional cross river link near to Blackwall means that the network would be much more resilient to a closure at any one of the tunnels
Goal 6: Support delivery of the London 2012 Olympic and Paralympics Games and its legacy			
Developing and implementing a viable and sustainable legacy for the 2012 Games	Supporting regeneration and convergence of social and economic outcomes between the five Olympic boroughs and the rest of London	Slight Positive	New cross river link in east London which would improve connectivity, however there would be a toll
	Physical transport legacy	Neutral	No impact
	Behavioural transport legacy	Neutral	No impact
Deliverability and Risks		**Option 9**	
		Silvertown bored tunnel	
Issue	**Assessment Criteria**		
Deliverability and Acceptability Risks	Engineering feasibility risk	Medium	Potential route, and land requirements on both sides of the river, have been identified
	Complexity of delivery (risk)	Medium	Impact on local developments and Blackwall tunnel during construction
	Consent risk	Medium	Powers would be required
	Funding risk	High	No funding secured
	Stakeholder acceptability risk	Low	Supported by local boroughs
	Public acceptability risk	Medium	Lots of support for tunnel, not much support for toll
	Overall deliverability risk	Medium	
Complexity of operation	Operational feasibility risk	Medium	Blackwall and Silvertown would need to be managed as a pair of tunnels
Value for Money	Benefit Cost Ratio	2.1< 4	Approximately 2.2 to 1
Affordability and Financial Sustainability	CAPEX	£500m <£1bn	£449m, £600m outturn prices
	OPEX per annum	£2m < £5m	New tunnel management arrangement
	Revenue implications per annum	> £50m	Assume toll at Blackwall
	Funding potential within TfL budget	Low	No funding secured
	Funding potential with private finance, e.g. via S106, securitisation of revenue, and DfT	Low	No impact on development, so no possibility to secure funding
Timescales	Timescale for delivering the changes	Long-term	
	Program risk	High	

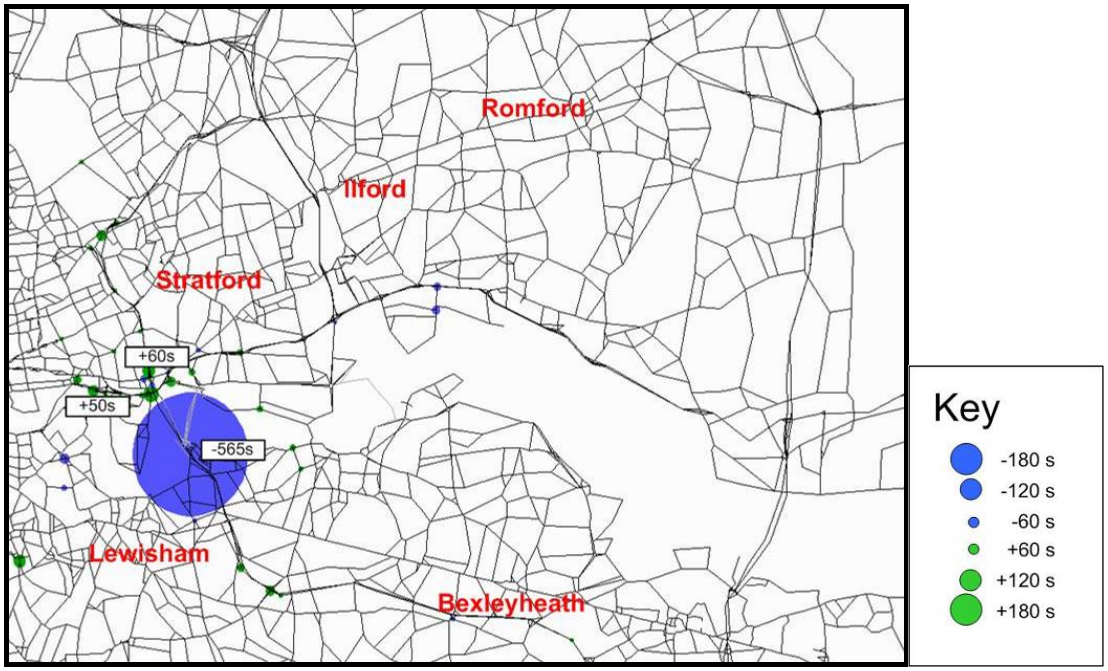
Option D3 – Assessment against programme objectives

Option D3 – improving the efficiency of the highway network

Peak congestion

6.103. A tunnel at this location would significantly reduce congestion at the Blackwall tunnel, by providing another high capacity crossing adjacent to it. The Figure below illustrated the potential changes in highway delay at nodes in the area following the construction of the Silvertown tunnel.

Figure 5.12 – Forecast changes in average junction delay with the Silvertown tunnel, morning peak, 2021 (s=second)



Source: TfL's East London Highway Assignment Model (ELHAM)

6.104. The extent of this relief, and the extent of any wider congestion issues, will depend on whether a user charging regime was applied. If the new crossing were not charged, then widespread congestion in the area is forecast, with the crossing resulting in much higher volumes of traffic in the surrounding area, which is already subject to congestion not directly related to Blackwall; currently the demand to cross at Blackwall in the peak direction is around 50% higher than the capacity of the tunnel.

6.105. However with the new crossing and Blackwall both charged, there is the potential to manage traffic generation to ensure that any demand growth is constrained to a level appropriate to the network capacity.

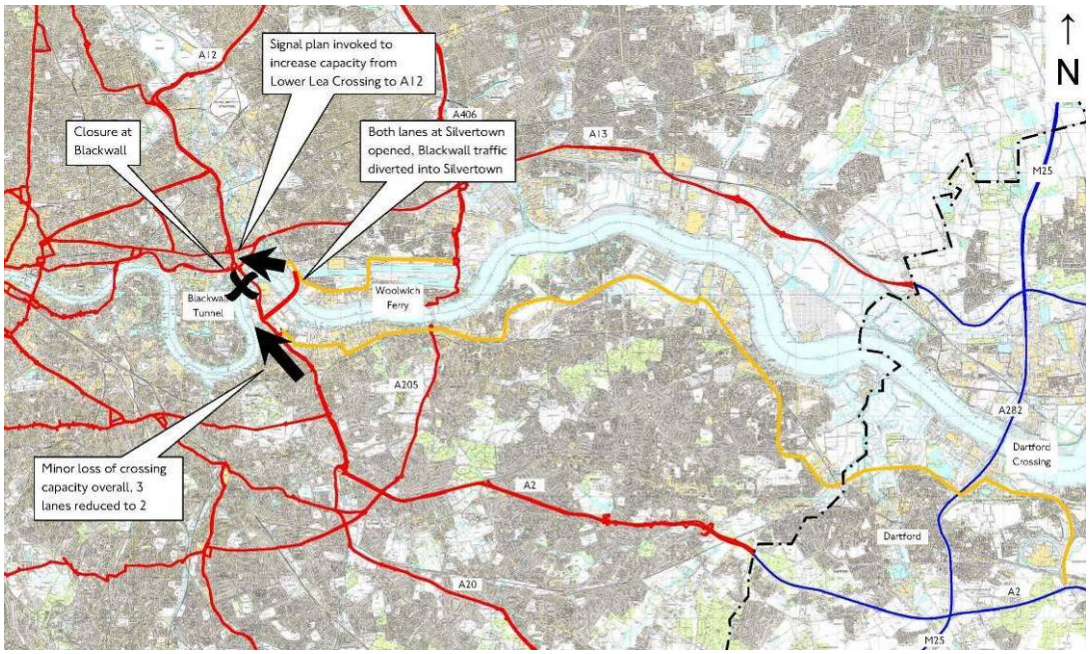
Crossing resilience and network reliability

6.106. The tunnel would be built to accommodate full highway gauge, of just over 5 metres headroom and standard lane widths. As such, it will be highly resilient, and will be able to make a very significant contribution to the reduction in the number of incidents occurring in the Blackwall tunnel.

6.107. When incidents do occur at Blackwall, the presence of the Silvertown tunnel would provide a very clear diversionary route for Blackwall traffic, to ensure that the effects are contained and do not cause such major congestion as currently occurs.

6.108. The Figure below illustrates the key impacts of a Blackwall closure with the Silvertown Crossing in place.

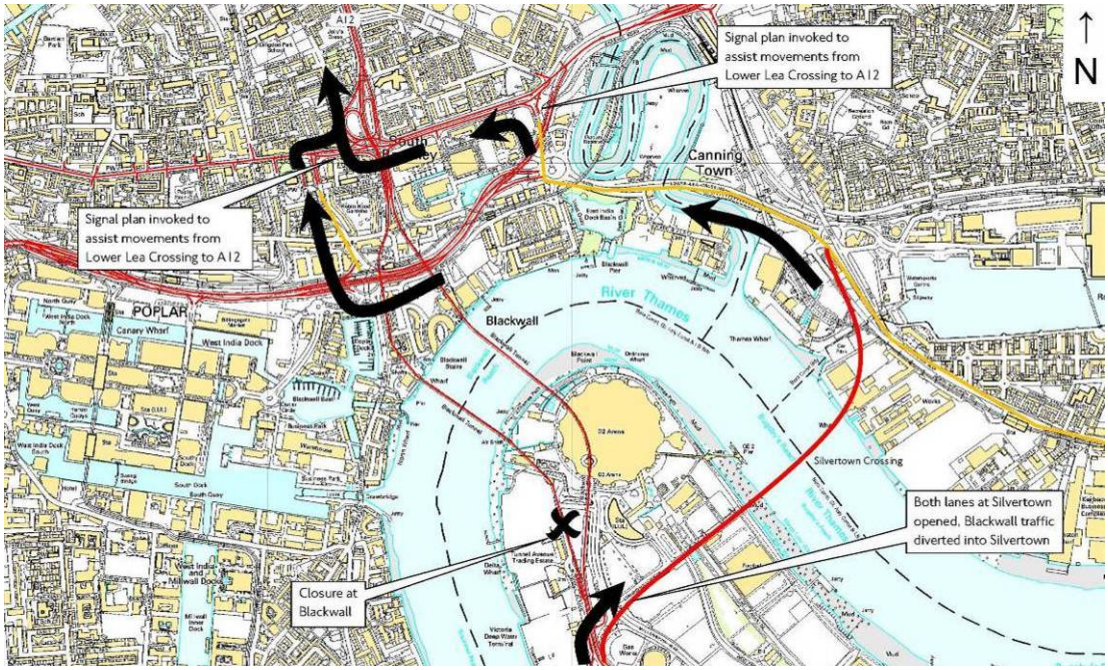
6.109. **Figure 5.13 – Blackwall resilience – key closure impacts with Silvertown**



6.110. With Blackwall closed, this traffic would be diverted to the Silvertown tunnel, which would provide two lanes instead of the three lanes normally available across the two crossings (this assumes that in normal operation one lane of the Silvertown tunnel will be a priority lane for goods vehicles and buses).

6.111. There would therefore be a loss of capacity at the merge to two lanes, which would result in some queuing on the approach to the tunnels. There would also be some restricted capacity on the route back to the A12 on the northern side, although this route is all dual carriageway, and with signal control at the A13 junction there is the potential to introduce a special signal plan to prioritise diverted tunnel traffic to take account of the unusual traffic flows during such an incident.

Figure 5.14 – Silvertown tunnel diversion route



6.112. As a result, there would be some additional delays for traffic, with oversaturation particularly if such an incident occurred during the morning peak when flows are highest. However, the delays would be very small compared to the current position, where no feasible diversion route exists.

6.113. Outside the morning peak, there will be lower flows which could more easily be accommodated within the two lanes of Silvertown.

Journey times

6.114. Journey times in the peak direction would be greatly reduced under this option, with more than 50% additional capacity over the river in this area. (In theory up to 100% additional capacity could be provided if both lanes are used by general traffic, although the wider road network capacity is such that this is unlikely to be achieved in practice). Peak period delays for current Blackwall tunnel users of around 20 minutes are likely to be effectively eliminated, while cross-river journeys to the areas best served by the new crossing, such as the Royal Docks, will save several minutes at any time of day.

Option D3 – supporting the public transport network

6.115. A full gauge road tunnel between the Greenwich Peninsula and the Royal Docks enables opportunities for new cross-river bus services, to improve direct connections from areas on either side of the river. As a tunnel would not open for around 10 years it is too early to make firm assumptions about the form of service, but it is clear that some opportunities exist to link the Royal Docks to areas south of the Thames. This could reduce the need for passengers to change at North Greenwich and again at Canning Town or via the Emirates Air Line to make a relatively short cross-river journey.

6.116. It would also offer a diversionary route for the 24 hour route 108, which currently uses the Blackwall tunnel but can suffer from lengthy diversions during Blackwall tunnel closures (including maintenance closures).

Option D3 – integrating with land use policies

6.117. A tunnel would offer a very fast route into the Canary Wharf and Royal Docks areas from the south, offering connectivity benefits to these Opportunity Areas. If the levels of local congestion at the Blackwall tunnel are reduced, and resilience greatly improved, there would be general benefits for a large area of east and south east London.

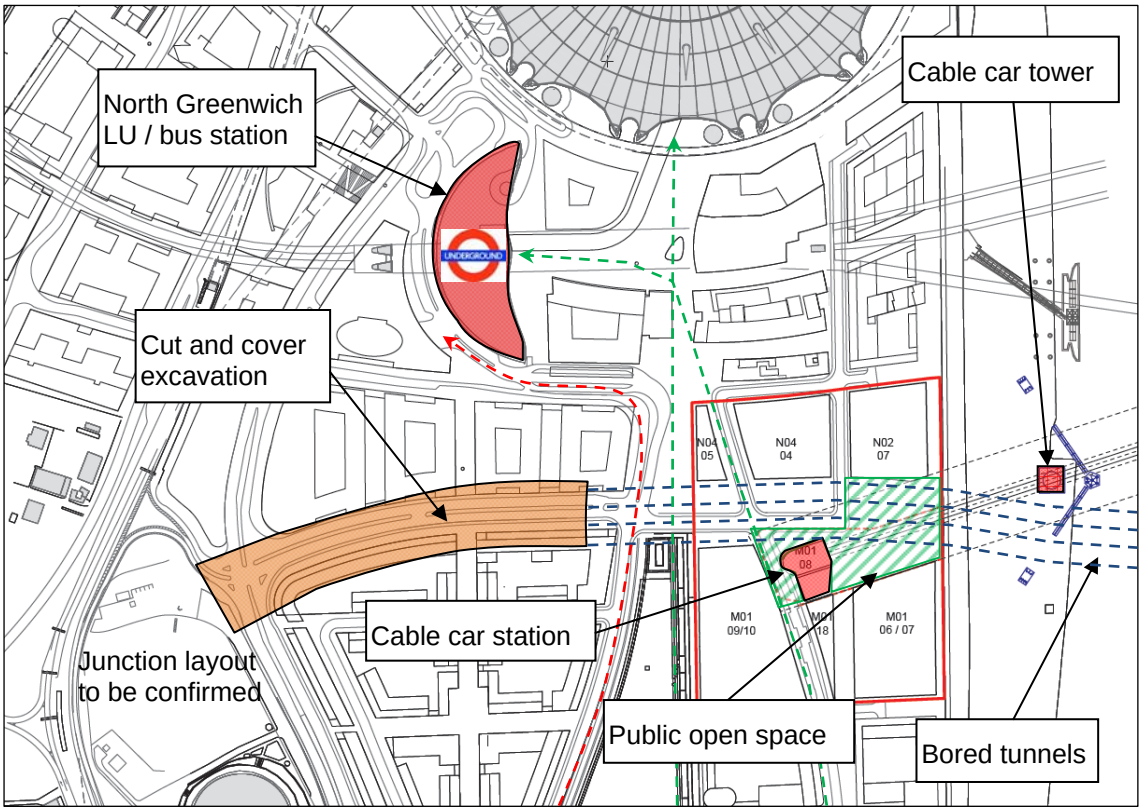
6.118. Physically, the tunnel would pass under the Greenwich Peninsula regeneration area on the southern side of the Thames, following the line of the existing Edmond Halley Way.

6.119. It will require a cut and cover tunnel to be constructed under the western end of Edmond Halley Way, between Millennium Way and West Parkside, with works likely to be beyond the current highway boundary. The land on either side of the street in this area is currently laid out as car parking, although in the longer term, there is outline permission for large residential blocks to be built on these plots.

6.120. To the east of this section, the bored tunnel option would result in the Silvertown crossing passing below the eastern end of Edmond Halley Way.

6.121. The Figures below illustrate the location of the tunnelling works, with the crossing busway marked in red and key pedestrian routes in green.

Figure 5.15 – South side: Silvertown tunnel as bored tunnel

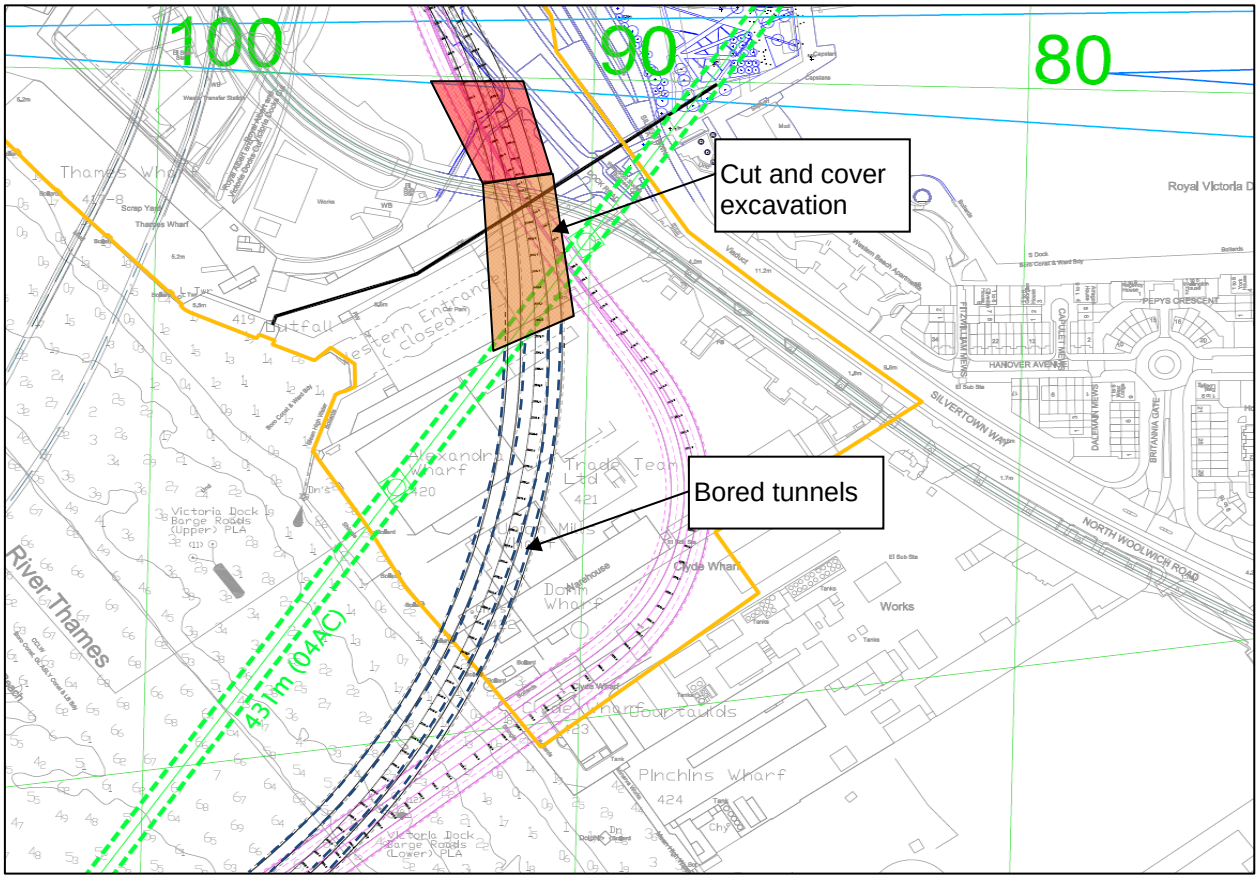


6.122. On the north bank, the crossing passes through a different environment, with the land principally used for industrial uses at present.

6.123. However, there are also advanced plans for redevelopment on the north side, with several of the plots occupied under relatively short leases, and stakeholders working on plans for development. The GLA has large landholdings either in whole or in joint venture companies, and it was previously indicated by the LDA (prior to its absorption into the GLA) that the land required can be made available at no cost to TfL. Given the transfer of the LDA's powers and land to the GLA, this will need to be revisited in due course.

6.124. There will be a need for a large worksite for the construction of the tunnel, with use of one of the existing wharves likely to be used for materials handling. This is likely to be compatible with the development phasing, with most occupiers on short-term leases with appropriate break clauses. Some land beyond GLA landholdings is required; it is likely that these occupiers could be relocated within the local vicinity on land owned by the GLA.

Figure 5.16 – North side: Silvertown tunnel as bored tunnel



6.125. The cable car scheme has been designed not to conflict with the construction of a Silvertown tunnel.

Option D3 – impacts on health, safety and the environment

6.126. This option is likely to improve resilience of the Blackwall Tunnel and reduce congestion, which has the potential to be significant in environmental terms. However, there would be some temporary impacts during construction of the tunnel, which should be balanced against the benefits. On balance, it is considered that there will be an environmental benefit.

6.127. By providing a full vehicle gauge crossing so close to Blackwall, with modern safety features and intervention/escape provision, it would reduce the volumes of large vehicles using the Blackwall tunnel, which would improve the safety of the Blackwall and putting these vehicles into a safer environment than the current tunnels.

Option D3 – borough and other stakeholder views

6.128. The tunnel concept is well supported by stakeholders generally and features in the relevant boroughs' local plans.

6.129. The bored tunnel option would take the crossing below the bed of the River Thames, and is unlikely to require any river works. There is the potential for some ground

treatment works to allow for tunnelling, in particular in the case of provision of escape cross-passages below the river. These are likely to be hand-dug from the main drives and may therefore require ground treatment from above. However, this work is likely to be of short duration, and is not expected by the Port of London Authority to pose any major difficulties.

Option D3 – achieving value for money

6.130. In June 2012, Mott MacDonald estimated the relative costs of a deep bored tunnel and immersed tunnel. It should be noted that these cost estimates take account of the more detailed geotechnical data now available, and includes some aspects excluded from the previous estimates. In 2010/11 a geotechnical study was carried out to ascertain much more detailed information on ground conditions for both the Silvertown tunnel and cable car, and the design of both deep bored and immersed tunnels has been advanced by Mott MacDonald to take account of this information and provide a much more detailed estimate of comparative construction costs. The level of risk and optimism bias would therefore reduce compared with any initial feasibility work undertaken previously without this information.

6.131. The base cost of the bored tunnel is expected to be around £350 million (current prices, excluding risk). With other additional costs for land, design, site investigation, construction supervision, future inflation and risk, this would be likely to rise to around £600 million in outturn prices.

6.132. User charging at the new tunnel would almost certainly be needed to provide a source of revenue to contribute towards the costs of construction; it would also help to manage the growth in demand which would otherwise occur if the peak period delays are eliminated by the provision of new capacity. Given the proximity of the Blackwall tunnel, that crossing would also need to be included within any charging regime, which would be a new cost imposed on users. Some will benefit overall from the reduced journey times when weighed against the cost, but some users may incur a charge without gaining a journey time advantage.

6.133. However all Blackwall tunnel users (and indeed many non-users on the local road networks) would benefit from the large improvements in crossing resilience if a new tunnel is constructed so close to the existing crossing.

Option D3 – Programme objective summary

6.134. The table below summarises the Silvertown bored tunnel option against the programme objectives.

		D3. Silvertown bored tunnel
To improve the efficiency of the highway network in the London Thames Gateway, especially at river crossings, and provide greater resilience for all transport users	Peak Blackwall congestion	Strong Positive
	Blackwall crossing resilience	Strong Positive
	Connectivity east of Greenwich	NA
	Approach road independence	Slight Negative
	Local road reliability (Greenwich)	Strong Positive
	Local road reliability (Woolwich)	Slight Positive
To support the needs of existing businesses in the area and to encourage new business investment	Local road reliability (Bexley)	Slight Positive
	Local road reliability (Royal Docks)	Moderate Positive
	JTs across sub-region (peak)	Slight Positive
	JTs across sub-region (off-peak)	Slight Positive
To support the provision of public transport services in the London Thames Gateway	Reliability of local buses	Moderate Positive
	Allows new orbital public transport	Slight Positive
	Mode shift potential, car to public	Neutral
To integrate with local and strategic land use policies	Lower Lea Valley OA	Slight Positive
	Greenwich Peninsula OA	Slight Positive
	Royal Docks OA	Slight Positive
	London Riverside OA	Neutral
	Bexley Riverside OA	Neutral
	Thamesmead & Abbey Wood OA	Neutral
	Woolwich OA	Slight Positive
	Charlton Riverside OA	Moderate Positive
To minimise the impacts of any proposals on health, safety and the environment	Health	Neutral
	Safety	Slight Positive
	Environment	Slight Positive
To ensure where possible that any proposals are acceptable in principle to key stakeholders, including affected boroughs	Local boroughs	Moderate Positive
	Other stakeholders	Moderate Positive
To achieve value for money	Business case	Moderate Positive
	Wider economic benefits	Moderate Positive
	Low cost for users	Moderate Negative
	CIL funding potential	Slight Positive
	Potential for user revenue to offset	Moderate Positive
	Capital cost	Moderate Negative

Assessment of Option D3 (Silvertown bored tunnel) – conclusion

6.135. Under Option D3, a bored tunnel would be built between the Greenwich peninsula and Silvertown.

6.136. This option has been assessed against the MTS goals and outcomes using SAF and the specific programme objectives.

Goal 1 – support economic development and population growth

6.137. The option performs positively against this goal, with the new tunnel providing additional capacity at this key bottleneck.

Goal 2 – quality of life

6.138. The option performs positively against this goal, due to reduced congestion and shorter journey times.

Goal 3 – safety and security

6.139. The option performs positively against this goal, with the new crossing providing a full vehicle gauge route as an alternative to the Blackwall tunnel.

Goal 4 – transport opportunities

6.140. The option performs positively against this goal, with improved accessibility arising from the new link.

Goal 5 – climate change

6.141. The option performs positively overall against this goal, provided that tolling would be applied to crossings to manage traffic levels to capture congestion benefits.

Goal 6 – support delivery of the London 2012 Olympic and Paralympic Games and its legacy

6.142. The option performs slightly positively against this goal, with a more reliable road network likely to encourage regeneration in the host boroughs, although the toll would affect some local road users.

Programme objectives

6.143. The above analysis shows that a bored tunnel meets many of the MTS policies, and the programme objectives for addressing the congestion problems in the Blackwall area and resilience well, although it would have a shared approach road (i.e. incidents on the A102 could affect both tunnels simultaneously).

6.144. **A bored road tunnel at Silvertown is recommended for further work**.

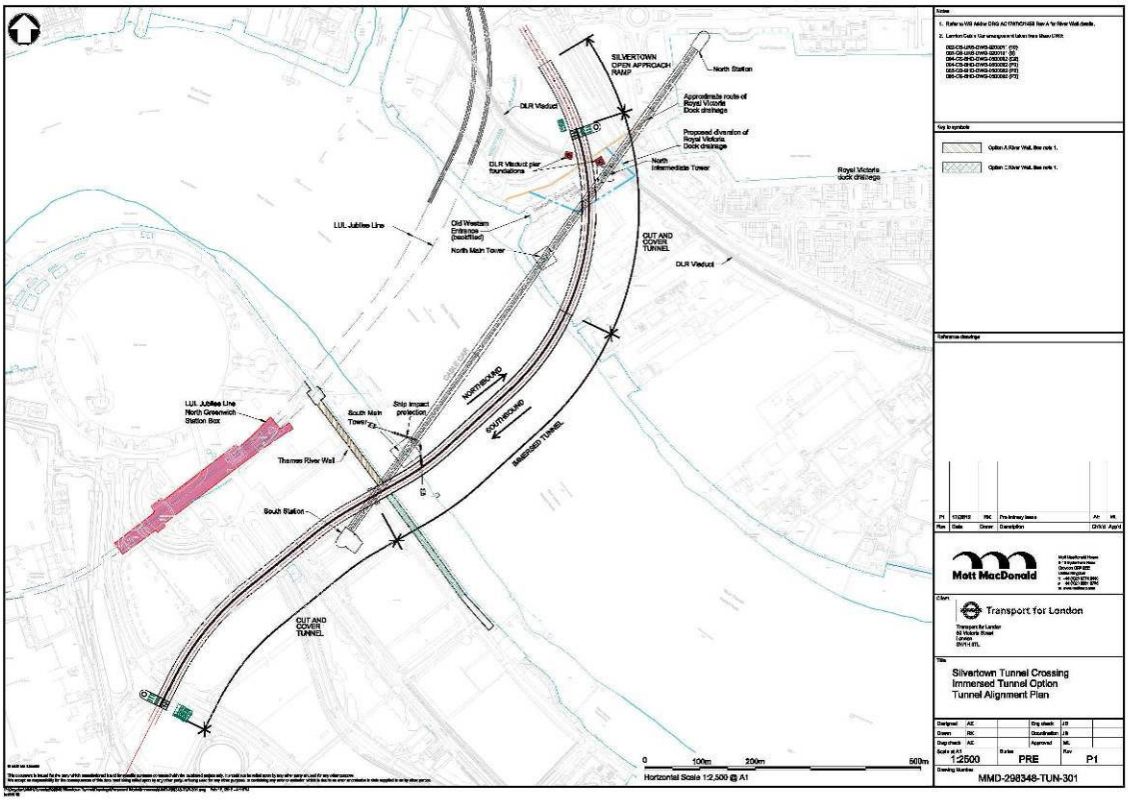
OPTION D4: SILVERTOWN IMMERSED TUNNEL

Option D4 – Option description

6.145. An alternative means of building a tunnel on the same alignment is to construct the Silvertown crossing as an immersed tunnel. Under this option, the tunnel would be built under a cut and cover method where it passes under land, and the river crossing would be built by construction of an excavated trench across the river into which sections of tunnel would be sunk.

6.146. On the north side, the scheme pass close to the cable car's North Intermediate Tower; the tower has been designed such that the construction of a cut and cover section close to it can be accommodated.

Figure 5.17 – Silvertown tunnel as an immersed tunnel



6.147. On the south side, the tunnel would pass between the South Main Tower (located in the foreshore of the River Thames) and the south station.

Option D4 – Assessment against SAF

6.148. The table below summarises the option against the Strategic Assessment Framework.

MTS Challenges	MTS Outcomes	Qualitative Score	Comments
Goal 1: Support economic development and population growth			
Supporting sustainable population and employment growth	Balancing capacity and demand for travel through increasing public transport capacity	Moderate Positive	Additional river crossing for vehicles, also it enables new cross river bus links
	Balancing capacity and demand for travel through reducing the need to travel	Slight Positive	Toll could be used to manage peak demand - details are not yet worked through
Improving transport connectivity	Improving people's access to jobs	Moderate Positive	Additional cross river link would improve access to jobs
	Improving access to commercial markets for freight movements and business travel	Strong Positive	Additional cross river link, suitable for HGVs, provides a new route for freight movements
Delivering an efficient and effective transport system for goods and people	Smoothing traffic flow (managing delay, improving journey time reliability and resilience)	Moderate Positive	Two road river crossings in similar location, would greatly improve users journey time and the reliability / resilience of the network. However the shared approach road on southern side means that an incident on the A102 could affect both tunnels
	Improving public transport reliability	Moderate Positive	Reduced congestion would improve reliability of local bus routes, also the tunnel provides a suitable diversion for route 108 when Blackwall tunnel is closed
	Reducing operating costs	Moderate Positive	Operating costs would be offset by revenues from the toll on both crossings
	Bringing and maintaining all assets to a state of good repair	Slight Positive	Provides a suitable diversion route during closures of the Blackwall tunnel, including maintanence closures. This improves the maintanence system of both tunnels
	Enhancing use of the Thames for people and goods	Strong Positive	Additional river crossing for vehicles, also it enables new cross river bus links
Goal 2: Quality of Life			
Improving journey experience	Improving public transport customer satisfaction	Slight Positive	Potential for improvements to local cross river bus connectivity
	Improving road user satisfaction (drivers, pedestrians, cyclists)	Moderate Positive	Improved journey time and reduced congestion at Blackwall, however, there would be a toll
	Reducing public transport crowding	Neutral	No impact
Enhancing the built and natural environment	Enhancing streetscape, improving the perception of urban realm and developing 'better streets' initiatives	Slight Negative	Big impact on urban realm on both sides of the river during construction
	Protecting and enhancing the natural environment	Slight Negative	Significant impact on the river during construction
Improving air quality	Reducing air pollutant emissions from ground based transport, contributing to EU air quality targets	Slight Positive	Reduced congestion and more resilient crossing would lead to reduced emissions, but tolling strategy would determine overall traffic volumes and therefore the wider congestion effect
Improving noise impacts	Improving perceptions and reducing impacts of noise	Neutral	No impact
Improving health impacts	Facilitating an increase in walking and cycling	Slight Negative	Negative impact on Greenwich peninsula, could lead to a decrease in the number of walking and cycling trips
Goal 3: Safety and security			
Reducing crime, fear of crime and anti-social behaviour	Reducing crime rates (and improving perceptions of personal safety and security)	Neutral	No impact
Improving road safety	Reducing the numbers of road traffic casualties	Slight Positive	Full vehicle gauge crossing with modern safety features, would reduce the number of large vehicles using Blackwall. This would improve safety there and put those vehicles into a safer environment
Improving public transport safety	Reducing casualties on public transport networks	Neutral	No impact

Goal 4: Transport Opportunities			
Improving accessibility	Improving the physical accessibility of the transport system	Neutral	No impact
	Improving access to services	Slight Positive	Opportunity for local cross river bus links to go through the tunnel, improving access to local services on both sides of the river
Supporting regeneration and tackling deprivation	Supporting wider regeneration	Slight Positive	Opportunity for new bus links in growth area
Goal 5: Climate change			
Reducing CO_2 emissions	Reducing CO_2 emissions from ground based transport, contributing to a London-wide 60% reduction by 2025	Slight Positive	Reduced congestion and more resilient crossing would lead to reduced emissions, but tolling strategy would determine overall traffic volumes and therefore the wider congestion effect
Adapting for climate change	Maintaining the reliability of transport networks	Moderate Positive	Additional cross river link near to Blackwall means that the network would be much more resilient to a closure at any one of the tunnels
Goal 6: Support delivery of the London 2012 Olympic and Paralympics Games and its legacy			
Developing and implementing a viable and sustainable legacy for the 2012 Games	Supporting regeneration and convergence of social and economic outcomes between the five Olympic boroughs and the rest of London	Slight Positive	New cross river link in east London which would improve connectivity, however there would be a toll
	Physical transport legacy	Neutral	No impact
	Behavioural transport legacy	Neutral	No impact
Deliverability and Risks		**Option 10**	
		Silvertown immersed tunnel	
Issue	**Assessment Criteria**		
Deliverability and Acceptability Risks	Engineering feasibility risk	High	Immersed tunnel is more difficult to build in this location, compared to a bored tunnel
	Complexity of delivery (risk)	High	Complex river works required, PLA would need to be involved
	Consent risk	High	Powers would be required, PLA may object due to impact on the river, so could be very difficult
	Funding risk	High	No funding secured
	Stakeholder acceptability risk	Medium	Likely to be opposed by RB Greenwich due to negative impact on Greenwich peninsula
	Public acceptability risk	High	Negative impact on Greenwich peninsula, plus not much support for toll
	Overall deliverability risk	High	
Complexity of operation	Operational feasibility risk	Medium	Blackwall and Silvertown would need to be managed as a pair of tunnels
Value for Money	Benefit Cost Ratio	2.1< 4	Approximately 2.2 to 1
Affordability and Financial Sustainability	CAPEX	£500m <£1bn	£518m, £650m outturn prices
	OPEX per annum	£2m < £5m	New tunnel management arrangement
	Revenue implications per annum	> £50m	Assume toll at Blackwall
	Funding potential within TfL budget	Low	No funding secured
	Funding potential with private finance, e.g. via S106, securitisation of revenue, and DfT	Low	No impact on development, so no possibility to secure funding
Timescales	Timescale for delivering the changes	Long-term	
	Program risk	High	

Option D4 – improving the efficiency of the highway network

Peak congestion

6.149. The immersed tunnel would have the same impacts as the bored tunnel, described in the previous section.

Crossing resilience and network reliability

6.150. The immersed tunnel would have the same impacts as the bored tunnel, described in the previous section.

Journey times

6.151. The immersed tunnel would have the same impacts as the bored tunnel, described in the previous section.

Option D4 – supporting the public transport network

6.152. The immersed tunnel would have the same impacts as the bored tunnel, described in the previous section.

Option D4 – integrating with land use policies

6.153. As under the bored option, the crossing passes across the Greenwich Peninsula regeneration area on the southern side of the Thames, and follows the line of the existing Edmond Halley Way.

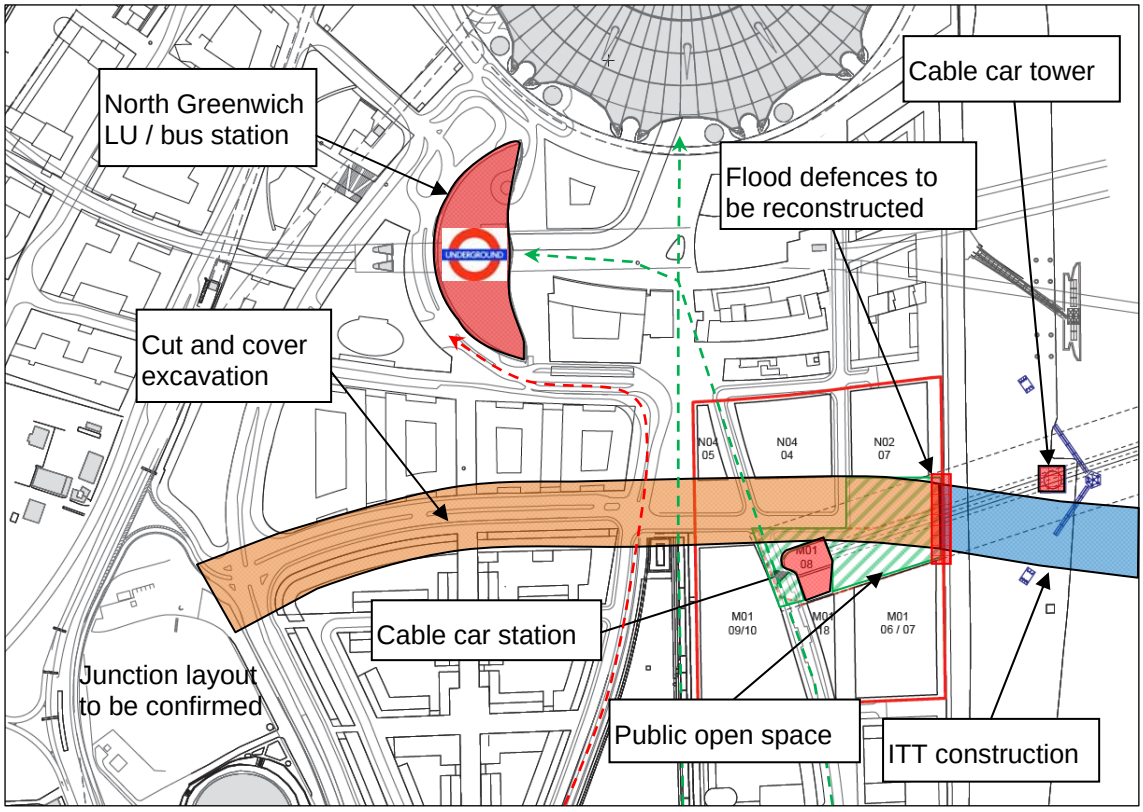
6.154. However, the immersed tunnel option would require cut and cover tunnel construction from the portal, across the peninsula, to the riverbank. This would have a serious impact on the circulation of people and vehicles in the area.

6.155. At West Parkside, Edmond Halley Way crosses West Parkside itself – a local distributor road for the peninsula – as well as the Pilot Busway, which provides a key transport spine for the peninsula, and feeds a large number of bus passengers into the bus and Underground station interchange at North Greenwich. It would also separate the new Emirates Air Line cable car station from the commercial district incorporating the bus and Underground stations and the amenities around The O_2.

6.156. As a result, the construction of a cut and cover tunnel from points east of West Parkside would pose a significant challenge to maintain the existing linkages which cross Edmond Halley Way, with the pedestrian routes, cable car access and busway particular challenges.

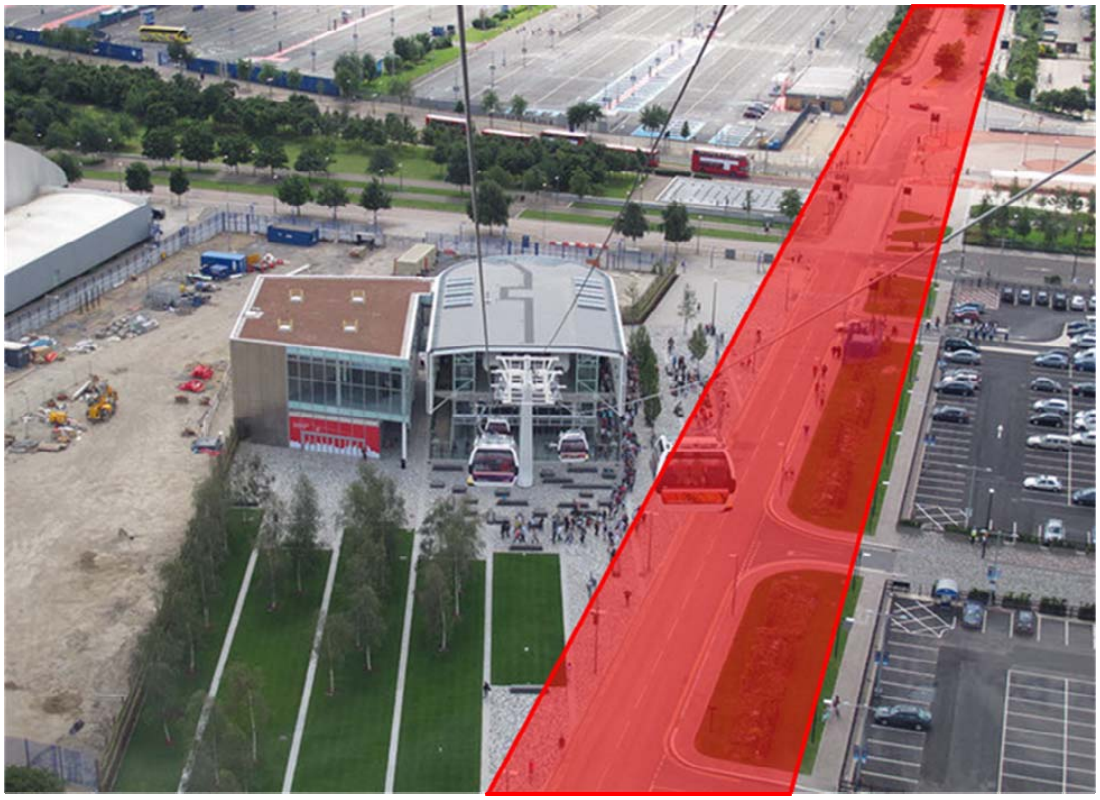
6.157. The figures below illustrate the location of the tunnelling works, with the crossing busway marked in red and key pedestrian routes in green.

Figure 5.18 – South side: Silvertown tunnel as Immersed Tube



6.158. The Figure below relates the required cut and cover tunnelling works for this option to the existing Emirates Air Line station and associated landscaping.

Figure 5.19 - Edmond Halley Way with the cable car scheme in place; the red area indicates the cut-and-cover excavation for an immersed tube tunnel

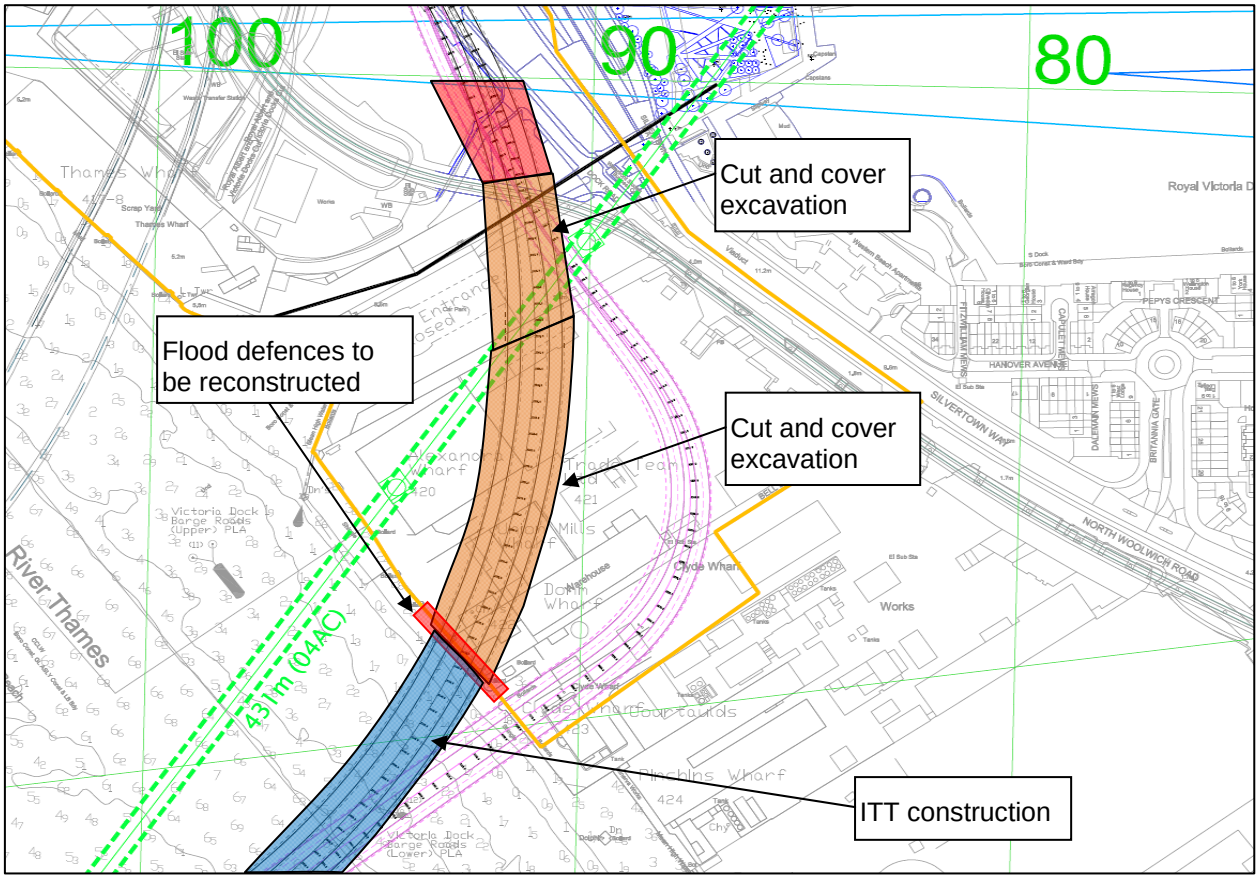


6.159. On the north bank, the crossing passes through a different environment, with the land principally used for industrial uses at present.

6.160. However, there are also advanced plans for redevelopment on the north side, with several of the plots occupied under relatively short leases, and stakeholders working on plans for development. The GLA has large landholdings either in whole or in joint venture companies, and it was previously indicated by the LDA (prior to its absorption into the GLA) that the land required can be made available at no cost to TfL. Given the transfer of the LDA's powers and land to the GLA, this will need to be revisited in due course.

6.161. In either bored or immersed tube tunnel options, there will be a need for a large worksite for the construction of the tunnel, with use of one of the existing wharves likely to be used for materials handling. This is likely to be compatible with the development phasing, with most occupiers on short-term leases with appropriate break clauses. Some land beyond GLA landholdings is required; it is likely that these occupiers could be relocated within the local vicinity on land owned by the GLA.

Figure 5.20 – North side: Silvertown tunnel as Immersed Tube



6.162. The cable car scheme has been designed not to conflict with the construction of a Silvertown tunnel.

6.163. However, on the south side, the tunnel would pass between the South Main Tower (located in the foreshore of the River Thames) and the south station.

6.164. The immersed tube scheme would place the two carriageways closer together than is possible under the bored tunnel option, resulting in a slightly narrower overall corridor for this option. As such, it should be physically possible to accommodate this option in terms of its footprint.

6.165. However, the river works associated with constructing the immersed tube tunnel are significant, and would require the construction of a deep trench in the Thames relatively close to the cable car. Special measures are likely to be required to ensure that the stability of the ground around the cable car tower is maintained if such works are to be carried out, and a high degree of disruption for passengers accessing the station is inevitable.

Option D4 – impacts on health, safety and the environment

6.166. The immersed tube tunnel would require very significant river works during construction, including:

(i) Reconstruction of the flood wall and flood defences on both banks;

(ii) Excavation of a large trough across the river;

(iii) Placement and sinking of tunnel sections;

(iv) Tunnel protective works to prevent damage from ship anchors, etc.

6.167. Whilst there would be environmental benefits as a result of reducing congestion and providing additional resilience to the Blackwall Tunnel, these are likely to be outweighed by these significant river works.

6.168. By providing a full vehicle gauge crossing so close to Blackwall, with modern safety features and intervention/escape provision, it would reduce the volumes of large vehicles using the Blackwall tunnel, which would improve the safety of the Blackwall and putting these vehicles into a safer environment than the current tunnels.

Option D4 – borough and other stakeholder views

6.169. The tunnel concept is well supported by stakeholders generally and the boroughs of Greenwich and Newham, but an immersed tunnel option would cause considerably more disruption to the Greenwich Peninsula regeneration area, including bisecting the routes between the central square and the heart of the peninsula, and therefore is likely to be strongly opposed by RB Greenwich.

6.170. The Port of London Authority (PLA) owns the River Thames and is responsible for managing and protecting the right of navigation on the river. It also, along with the Environment Agency and Marine Management Organisation, has responsibilities for protecting the marine environment, including ecology and hydrology.

6.171. TfL discussed with the PLA the issues around alternative crossing types, and the PLA raised a number of issues which would need to be resolved to the satisfaction of the marine authorities.

6.172. These include:

(i) Impact on river hydrology of the trench excavation, given the sediment flows in this part of the Thames;

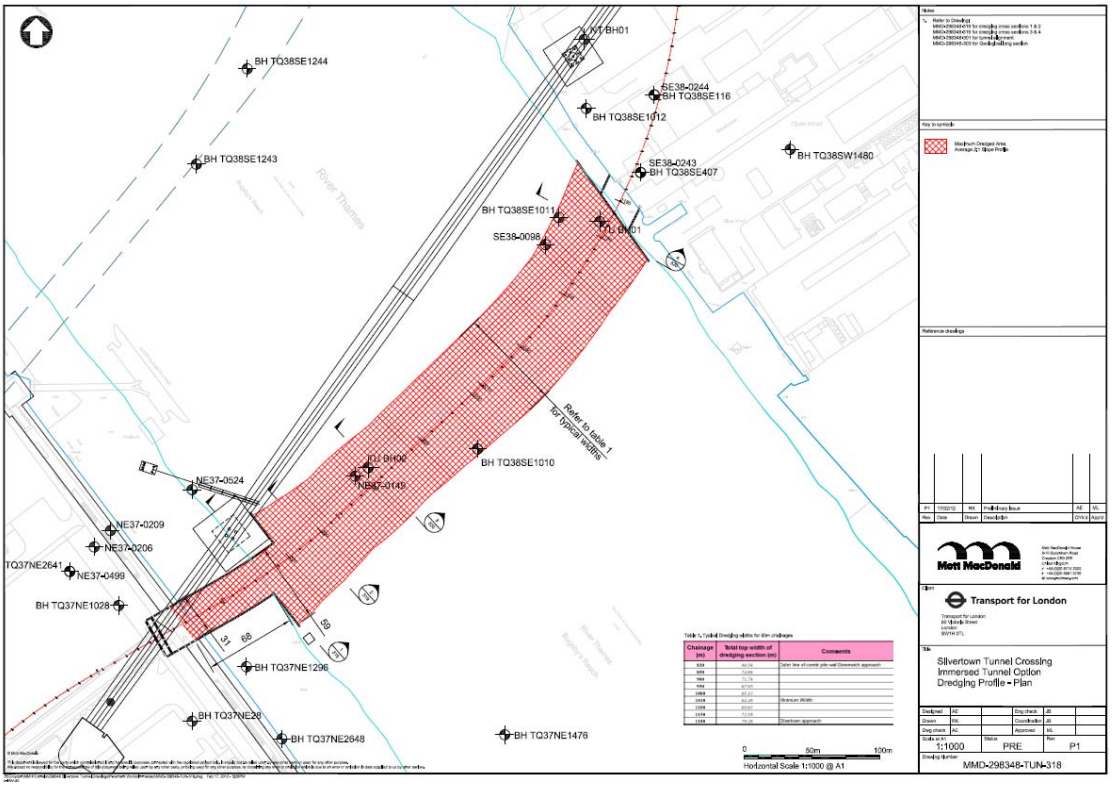
(ii) Impact on shipping of the dredging/trench excavation operation, with significant commercial traffic on the river with each tide;

(iii) Impact on shipping of the tunnel section delivery, alignment, sinking and protection works, with river closures impacting significantly on river traffic including major barge movements for construction projects including the Thames Tideway Tunnel, and – if in the summer months – on cruise ship arrivals/departures;

(iv) Impact on ecology, with the foreshore on the southern side being a key migration route for marine life.

6.173. The Figure below illustrates the extent of the trench required to construct the immersed tunnel in the river.

Figure 5.21 – River trench required for Immersed Tube tunnel at Silvertown



6.174. At the Silvertown Crossing location – Bugsby's Reach – there is a significant foreshore which is environmentally sensitive. Discussions with the PLA and Environment Agency to secure the construction of a tower foundation for the cable car have highlighted the difficulty in dealing with even minor works affecting the river bed, foreshore and bank in this area.

6.175. A tunnel at Silvertown would be authorised by a development consent order ("DCO") made under the Planning Act 2008, following a direction made by the Secretary of State under section 35 of that Act. Were the PLA (and other marine authorities) to object to the Order application, it may be difficult to gain powers in the face of opposition by these important consultees.

Option D4 – achieving value for money

6.176. In June 2012, Mott MacDonald estimated the relative costs of a deep bored tunnel and immersed tunnel. It should be noted that these cost estimates take account of the more detailed geotechnical data now available, and includes some aspects excluded from the previous estimates. In 2010/11 a geotechnical study was carried out to ascertain much more detailed information on ground conditions for both the Silvertown tunnel and cable car, and the design of both deep bored and immersed tunnels has been advanced by Mott MacDonald to take account of this information and provide a much more detailed estimate of comparative construction costs. The level of risk and optimism bias would therefore reduce compared with any initial feasibility work undertaken previously without this information.

6.177. The base cost of the immersed tunnel is expected to be around £400 million (current prices, excluding risk). With other additional costs for land, design, site investigation, construction supervision, future inflation and risk this would be likely to rise to around £650 million in outturn prices.

6.178. By comparison, the base cost of the bored tunnel is expected to be around £350 million (current prices, excluding risk). With other additional costs for land, design, site investigation, construction supervision, future inflation and risk, this would be likely to rise to around £600 million in outturn prices.

6.179. This analysis shows the bored tunnel to be cheaper than the immersed tunnel. This is primarily because the immersed tunnel includes lengthy cut and cover tunnels at each approach, to match the portal positions of the bored tunnel and there is a significant cost associated with the provision of the casting basin on site.

6.180. A number of cost saving opportunities have been identified for the immersed tunnel, including reducing the length of cut and cover tunnels, and building the tunnel elements off-site. If these opportunities could be realised the immersed tunnel has the potential to become the cheaper scheme.

6.181. However, this is uncertain, and off-site casting would add risk related to floatation of tunnel segments along the Thames. The immersed tunnel would still carry very significant additional impacts related to property and the river environment which would be likely to add more cost in terms of mitigation and environmental licences.

6.182. For example, an immersed tube tunnel would need to be licensed under the PLA's River Works Licence regime. TfL has previously negotiated a River Works Licence for the Thames Gateway Bridge (TGB) scheme, which was valued at £6M in 2006; it has been assumed that a similar licence at today's prices would be £8M. An additional £6.2M was costed by TfL and PLA for the additional towage charges for shipping during construction of the bridge piers; this is likely to equate to around £8M at today's prices. With a longer invasive construction programme for an immersed tube tunnel compared with bridge piers, this cost could double to £16M for an immersed tube tunnel.

6.183. User charging at the new tunnel would almost certainly be needed to provide a source of revenue to contribute towards the costs of construction; it would also help to manage the growth in demand which would otherwise occur if the peak period delays are eliminated by the provision of new capacity. Given the proximity of the

Blackwall tunnel, that crossing would also need to be included within any charging regime, which would be a new cost imposed on users. Some will benefit overall from the reduced journey times when weighed against the cost, but some users may incur a charge without gaining a journey time advantage.

6.184. However all Blackwall tunnel users (and indeed many non-users on the local road networks) would benefit from the large improvements in crossing resilience if a new tunnel is constructed so close to the existing crossing.

Option D4 – Programme objective summary

6.185. The table below summarises the Silvertown immersed tunnel option against the programme objectives.

		D4. Silvertown ITT tunnel
To improve the efficiency of the highway network in the London Thames Gateway, especially at river crossings, and provide greater resilience for all transport users	Peak Blackwall congestion	Strong Positive
	Blackwall crossing resilience	Strong Positive
	Connectivity east of Greenwich	NA
	Approach road independence	Slight Negative
	Local road reliability (Greenwich)	Strong Positive
	Local road reliability (Woolwich)	Slight Positive
To support the needs of existing businesses in the area and to encourage new business investment	Local road reliability (Bexley)	Slight Positive
	Local road reliability (Royal Docks)	Moderate Positive
	JTs across sub-region (peak)	Slight Positive
	JTs across sub-region (off-peak)	Slight Positive
To support the provision of public transport services in the London Thames Gateway	Reliability of local buses	Moderate Positive
	Allows new orbital public transport	Slight Positive
	Mode shift potential, car to public	Neutral
To integrate with local and strategic land use policies	Lower Lea Valley OA	Slight Positive
	Greenwich Peninsula OA	Slight Negative
	Royal Docks OA	Slight Negative
	London Riverside OA	Neutral
	Bexley Riverside OA	Neutral
	Thamesmead & Abbey Wood OA	Neutral
	Woolwich OA	Slight Positive
	Charlton Riverside OA	Moderate Positive
To minimise the impacts of any proposals on health, safety and the environment	Health	Neutral
	Safety	Slight Positive
	Environment	Slight Negative
To ensure where possible that any proposals are acceptable in principle to key stakeholders, including affected boroughs	Local boroughs	Slight Negative
	Other stakeholders	Slight Negative
To achieve value for money	Business case	Moderate Positive
	Wider economic benefits	Moderate Positive
	Low cost for users	Moderate Negative
	CIL funding potential	Slight Positive
	Potential for user revenue to offset	Moderate Positive
	Capital cost	Moderate Negative

Assessment of Option D4 (Silvertown immersed tunnel) – conclusion

6.186. Under Option D4, an immersed tunnel would be built between the Greenwich peninsula and Silvertown.

6.187. This option has been assessed against the MTS goals and outcomes using SAF and the specific programme objectives.

Goal 1 – support economic development and population growth

6.188. The option performs positively against this goal, with the new tunnel providing additional capacity at this key bottleneck.

Goal 2 – quality of life

6.189. The option performs neutrally overall against this goal, with reduced congestion and shorter journey times potentially offset by construction impacts on the river and on the Greenwich peninsula.

Goal 3 – safety and security

6.190. The option performs positively against this goal, with the new crossing providing a full vehicle gauge route as an alternative to the Blackwall tunnel.

Goal 4 – transport opportunities

6.191. The option performs positively against this goal, with improved accessibility arising from the new link.

Goal 5 – climate change

6.192. The option performs positively overall against this goal, provided that tolling would be applied to crossings to manage traffic levels to capture congestion benefits.

Goal 6 – support delivery of the London 2012 Olympic and Paralympic Games and its legacy

6.193. The option performs slightly positively against this goal, with a more reliable road network likely to encourage regeneration in the host boroughs, although the toll would affect some local road users.

Programme objectives

6.194. The table shows that an immersed tunnel meets many of the MTS policies, and the programme objectives for addressing the congestion problems in the Blackwall area and resilience well, although it would have a shared approach road (i.e. incidents on the A102 could affect both tunnels simultaneously).

6.195. However it would have a detrimental effect on the planned development of the Greenwich peninsula and would have a significant effect on the river environment. Work suggests that it would cost more to build in this constrained environment than a bored tunnel.

6.196. **An immersed road tunnel at Silvertown is not recommended for further work**.

Woolwich options

6.197. The North and South Circulars provide the primary orbital route around London within the M25, and the two routes meet at the Woolwich Ferry, which provides a valued (although low capacity) link between the two.

6.198. The North Circular Road (A406) is grade separated for the most part, with the section through east London upgraded in the late 1980s to a dual-carriageway as far as the A13. The final section to the Woolwich Ferry is urban in character, and unsuitable for high volumes of traffic.

6.199. The South Circular Road (A205) has some high-capacity sections, but is generally of a much lower capacity than the North Circular, with several sections being urban single carriageway roads with residential frontage. The section around and between the A2 and A20 is of a higher capacity than much of the road, and provide dual-carriageway connections to these trunk routes to the M25. However between here and Woolwich the road narrows and passes through bottlenecks, notably the Shooters Hill junction.

6.200. Traffic seeking to make an orbital journey in the east is more likely to use the A2, Blackwall Tunnel and A12 as the orbital corridor, rather than the South and North Circulars. Providing a new link between the North and South Circulars could potentially therefore improve orbital movements, and relieve traffic at the over-capacity Blackwall Tunnel.

6.201. Two options have been considered; a bridge and a tunnel.

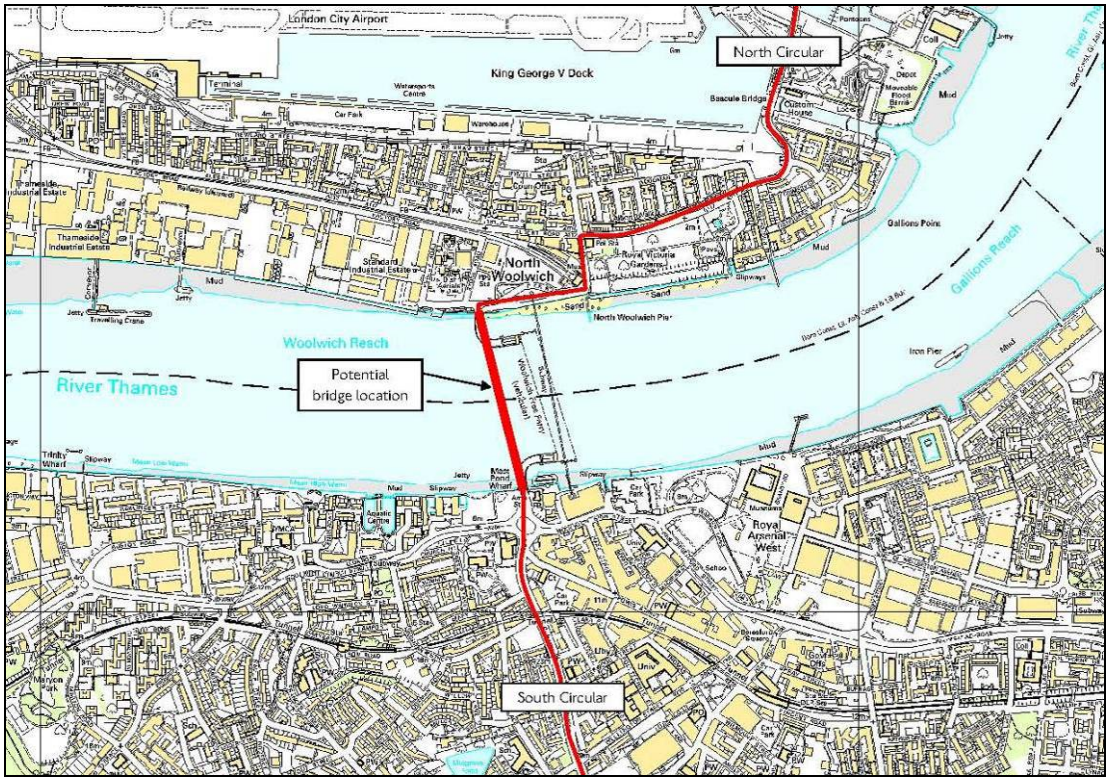
OPTION D5 – WOOLWICH ROAD BRIDGE

Option D5 – Option description

6.202. A new bridge at Woolwich has been considered. The areas to both sides of the crossing are urban, and there is no available land for the type of ramps required for a bridge with high clearance; as a result, a bridge would need to be a low-level bridge, which opens to allow for shipping.

6.203. The bridge would be directly connected into the existing North and South Circular roads, as shown in the Figure below.

Figure 5.22 – Potential Woolwich bridge location



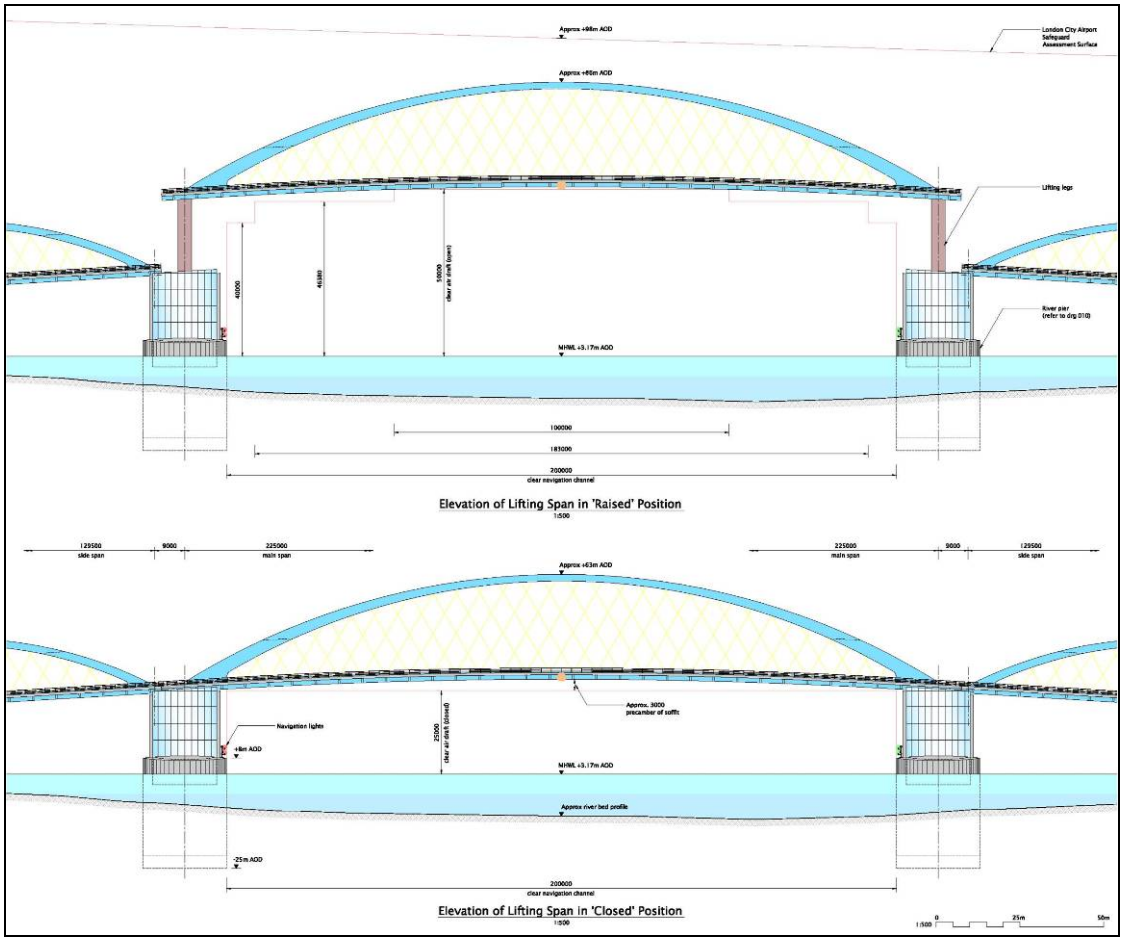
6.204. A fixed link would carry substantially greater traffic volumes than the existing ferry; a single lane link could carry up to around 1,800 vehicles per hour, over ten times the capacity of the Woolwich Ferry. However, the approach roads are designed to handle the level of flows associated with the ferry, and would not be well placed to accommodate the flows associated with a fixed link.

Figure 5.23 – North Woolwich

6.205. Figure 5.23 above shows the layout of the junction of Pier Road and Albert Road in North Woolwich. The junction is currently a priority (give way) junction, with zebra crossings for pedestrians; it is not capable of enhancement to handle the flows associated with a fixed link without significant road widening, including demolition of property. It is unlikely that this would be supported by the local community or local authority.

6.206. Figure 5.24 below illustrates the type of structure which could be employed to provide a lifting bridge at this location.

Figure 5.24 – Preliminary design of lifting bridge option



6.207. The clearances required would need to be agreed with the Port of London Authority, to ensure that the river remains navigable for the ships using the river; this level is likely to be similar to the 54 metres above high water which is accommodated at the QEII Bridge at Dartford; a height of 50 metres was previously agreed for the Thames Gateway Bridge scheme.

6.208. In this example, the centre span of the bridge lifts from its low-level position in which it is open to traffic (likely to be a maximum of 15 metres above high water level) to a height sufficient to allow for shipping (around 50 metres). The width of span necessary to clear the navigational channel (around 200 metres) suggests that a bascule bridge would not be feasible; the central span at Tower Bridge, for example, is only 61 metres.

Option D5 – Assessment against SAF

6.209. The table below summarises the option against the Strategic Assessment Framework.

MTS Challenges	MTS Outcomes	Qualitative Score	Comments
Goal 1: Support economic development and population growth			
Supporting sustainable population and employment growth	Balancing capacity and demand for travel through increasing public transport capacity	Slight Positive	Additional river crossing for vehicles. However, it would need to open for passing ships, up to 15 times a day. Therefore would not be feasible to run buses across the bridge. Also, ship movements may coincide with peak traffic movements, and there could be a lot of congestion at certain times
	Balancing capacity and demand for travel through reducing the need to travel	Slight Positive	Toll could be used to manage peak demand - details are not yet worked through
Improving transport connectivity	Improving people's access to jobs	Slight Positive	Additional cross river link would improve access to jobs, but the link is unreliable
	Improving access to commercial markets for freight movements and business travel	Slight Positive	Additional cross river link, suitable for HGVs, however it would be unreliable due to regular closures for shipping movements
Delivering an efficient and effective transport system for goods and people	Smoothing traffic flow (managing delay, improving journey time reliability and resilience)	Moderate Negative	Unreliable link, so would not improve reliability for cross river trips, build up of traffic when the bridge is open would have a negative impact on local traffic on both sides of the river
	Improving public transport reliability	Slight Negative	The bridge would need to open for ship movements and when this happens it would lead to congestion on the local road networks on both sides of the river, this would affect the local bus network
	Reducing operating costs	Slight Positive	High operating costs linked to lifting aspect of the bridge Tolls would generate revenue
	Bringing and maintaining all assets to a state of good repair	Slight Positive	Replaces Woolwich ferry which is currently difficult to maintain
	Enhancing use of the Thames for people and goods	Slight Positive	Additional crossing. Ship movements get priority so no negative impact on shipping
Goal 2: Quality of Life			
Improving journey experience	Improving public transport customer satisfaction	Neutral	No impact
	Improving road user satisfaction (drivers, pedestrians, cyclists)	Slight Positive	New crossing
	Reducing public transport crowding	Neutral	No impact
Enhancing the built and natural environment	Enhancing streetscape, improving the perception of urban realm and developing 'better streets' initiatives	Slight Negative	Increased traffic and regular congestion build up on both sides of the river, would affect the urban realm, pedestrians and cyclists
	Protecting and enhancing the natural environment	Moderate Negative	Big construction impact and impact on the river
Improving air quality	Reducing air pollutant emissions from ground based transport, contributing to EU air quality targets	Moderate Negative	Increased congestion would lead to increased emissions, in a densely built up area
Improving noise impacts	Improving perceptions and reducing impacts of noise	Neutral	Additional traffic noise on north and south circular roads. These are in residential areas, however, they are already heavily trafficed so not much extra impact
Improving health impacts	Facilitating an increase in walking and cycling	Neutral	No impact
Goal 3: Safety and security			
Reducing crime, fear of crime and anti-social behaviour	Reducing crime rates (and improving perceptions of personal safety and security)	Neutral	No impact
Improving road safety	Reducing the numbers of road traffic casualties	Slight Positive	Full vehicle gauge crossing with modern safety features would reduce the number of large vehicles using Blackwall. This would improve safety there and put those vehicles into a safer environment, but only when the bridge is open
Improving public transport safety	Reducing casualties on public transport networks	Neutral	No impact

Goal 4: Transport Opportunities			
Improving accessibility	Improving the physical accessibility of the transport system	Neutral	No impact
	Improving access to services	Neutral	No impact (although it is a bridge, because of the lifting aspect it would not be feasible to run cross river bus services on it)
Supporting regeneration and tackling deprivation	Supporting wider regeneration	Neutral	No opportunity for buses or cyclists due to lifting mechanism
Goal 5: Climate change			
Reducing CO_2 emissions	Reducing CO_2 emissions from ground based transport, contributing to a London-wide 60% reduction by 2025	Moderate Negative	Increased congestion would lead to increased emissions, in a densely built up area
Adapting for climate change	Maintaining the reliability of transport networks	Neutral	The bridge would need to open for ships and so it would not improve the reliability and resilience of the network
Goal 6: Support delivery of the London 2012 Olympic and Paralympics Games and its legacy			
Developing and implementing a viable and sustainable legacy for the 2012 Games	Supporting regeneration and convergence of social and economic outcomes between the five Olympic boroughs and the rest of London	Neutral	New cross river link in east London which would improve connectivity, however it is unreliable and there would be a toll
	Physical transport legacy	Neutral	No impact
	Behavioural transport legacy	Neutral	No impact
Deliverability and Risks		**Option 11**	
		Woolwich lifting bridge	
Issue	**Assessment Criteria**		
Deliverability and Acceptability Risks	Engineering feasibility risk	High	Lifting bridge of this scale has been described as at the limits of the technology
	Complexity of delivery (risk)	High	Lifting bridge and dense area makes this complex
	Consent risk	Medium	Powers would be required
	Funding risk	High	No funding secured
	Stakeholder acceptability risk	High	May be initially supportive but the traffic impacts are likely to be major issues for local boroughs
	Public acceptability risk	High	Major traffic impacts and toll, unlikely to get public support
	Overall deliverability risk	High	
Complexity of operation	Operational feasibility risk	High	Lifting bridge would require additional mechanical and operational staff, would make river operations more complex, and would make traffic management more difficult
Value for Money	Benefit Cost Ratio	Unknown	Not quantified
Affordability and Financial Sustainability	CAPEX	£200m < £500m	Expect to be slightly cheaper than a tunnel
	OPEX per annum	£2m < £5m	Lifting bridge is a mechanical aspect, with ongoing costs
	Revenue implications per annum	£10m < £50m	Cannot assume toll at Blackwall
	Funding potential within TfL budget	Low	No funding
	Funding potential with private finance, e.g. via S106, securitisation of revenue, and DfT	Low	No impact on development, so no possibility to secure funding
Timescales	Timescale for delivering the changes	Long-term	
	Program risk	High	

Option D5 – Assessment against programme objectives

Option D5 – improving the efficiency of the highway network

Peak congestion

6.210. In normal operation, the link would provide a significant increase in capacity beyond that offered by the Woolwich ferry. However, the approach roads would not be able to support the kind of flows which a bridge would be likely in typical operation to attract. Charging may play a role in managing traffic demand, but even so the limited traffic capacity on the approach road network is likely to result in considerable congestion in normal operation in both Woolwich and North Woolwich, given the large reduction in journey times offered by such a crossing compared to the existing ferry, even if users must ensure several minutes of delay to cross.

6.211. However while even a congested bridge could offer faster journey times to crossing users, the resultant congestion would not only erode the benefits for crossing users, but would also impact upon local traffic which is not seeking to cross the Thames but to pass through Woolwich or North Woolwich. Disbenefits to these road users will offset against any benefits to the crossing users.

Crossing resilience and network reliability

6.212. A lifting bridge at Woolwich would need to open for shipping on a regular basis; work by Hyder for the Silvertown crossing estimates that a bridge of around 15m air draft would need to open for up to 15 vessels per day, including sailing yachts, tugs, hopper barges, aggregate dredgers, and bulk vessels.

6.213. The length of opening would need to be agreed with the PLA; this would include an allowance of time for shipping movements to be aborted in the event that the bridge cannot be opened for shipping. For large ships this time could be over 20 minutes, as the possible locations for large ships to abort are limited in number.

6.214. Small crafts with masts higher than the bridge height (approx 15m) will generally not have such onerous requirements as large ships, because in an emergency they could abort and drop anchor close to the crossing. For these craft, a shorter opening time could be allowed, of around 5-10 minutes.

6.215. If this crossing were to open for 10 minutes, a queue would rapidly build. With a one-way capacity of 1,800 vehicles per hour (assuming only a single lane), a realistic typical flow of 1,200 could be expected; this is similar to the actual flow on the single carriageway Rotherhithe tunnel, taking into account the finite capacity of approach roads/junctions.

6.216. At this level of demand, a 10 minute closure to traffic would equate to a demand in this period of 200 vehicles; with a typical length (including bumper-to-bumper space) of 6 metres per vehicle, this queue would stretch for 1.2 km, significantly longer than the available queuing space on both sides of the river. A longer opening, for example for a cruise ship unable to abort as quickly as a smaller craft, could interrupt service for over twice as long.

6.217. Given the dynamics of queuing traffic, even when the bridge re-opens to traffic, the front of the queue will start to move some time before the back of the queue clears, so the queue would in reality be longer than this.

6.218. The effect of this interruption in capacity would be that queues would rapidly extend throughout Woolwich and North Woolwich, with all vehicles seeking to use the local road network – including buses and other traffic not seeking to use the crossing – affected by the congestion.

Journey times

6.219. The capacity of a crossing in this area would be more limited by the approach road network than by the crossing itself; it is assumed that a single carriageway bridge would be sufficient, as no crawling lane would be required for long gradients (in the case of a high level bridge), and the approach roads, particularly on the northern side, could not accommodate significant flows of traffic.

6.220. The crossing capacity would in theory be around 1,800 vehicles per hour, but in practice much lower flows would be achieved due to these wider network constraints.

6.221. The journey times on the crossing would be very considerably reduced compared with the current ferry, as vehicles will cross the Thames in around 1-2 minutes compared with closer to 10 minutes with the ferry. This time saving would be eroded by the effects of traffic congestion, especially at peak periods. However for cross-river trips, even taking into account congestion, journey times are likely to be substantially faster than with the current ferry.

Option D5 – supporting the public transport network

6.222. A bridge at Woolwich would in theory allow the provision of orbital bus services across the river at Woolwich, which could greatly improve orbital connectivity in this area. However, in practice the regular and lengthy closures to traffic to allow ship movements would result in highly unreliable journey times, and it would be very difficult to maintain a reliable bus service with these regular interruptions to the services.

6.223. In addition, the congestion associated with bridge closures would be likely to reduce the reliability of existing bus services in Woolwich and North Woolwich.

Option D5 – integrating with land use policies

6.224. A fixed link would in general have a very positive regeneration impact in the areas served. However, under this option there is the potential for irregular severe congestion as a result of shipping movements, and these would have the potential to greatly disrupt the flow of traffic on both sides of the Thames in this area. This would impact on local traffic, including buses, which is not seeking to cross the Thames. As a result, this would reduce, or potentially even reverse, the benefits arising from the capacity when the bridge is open to road traffic.

6.225. The impact on regeneration would also depend in part on the infrastructure necessary to support a new crossing. These have not been defined, but would in all likelihood result in road widening to accommodate the higher flows, especially in North Woolwich. This would impact upon the attractiveness of the area.

Option D5 – impacts on health, safety and the environment

6.226. This option has the potential to provide an additional pedestrian and cycling route and therefore, may have a positive impact on health.

6.227. This option would have environmental benefits as a result of reducing congestion and providing additional resilience to the Blackwall Tunnel. There is likely to be queuing whilst the lift bridge is raised, which will reduce the environmental benefits of the bridge. These benefits are likely to be outweighed by the impact to the river associated with construction of the bridge piers. The bridge may also have a visual impact.

6.228. By providing a full vehicle gauge crossing linking the North and South Circular roads, it would reduce the volumes of large vehicles using the Blackwall tunnel, which would improve the safety of the Blackwall tunnel.

Option D5 – borough and other stakeholder views

6.229. Stakeholder views have not been directly sought given the feasibility issues identified with this option. It is likely that while a fixed link at this location may be seen initially as an improvement over the current operation by the affected boroughs, the operational impacts and the issues around capacity and queuing on the wider road network are likely to be major issues for the local boroughs of Greenwich and Newham, and are not likely to be resolvable to their satisfaction.

6.230. Construction of a bridge at this location would require substantial negotiation with the Port of London Authority (PLA). This location is close to the Thames Barrier, and therefore the PLA would have stringent requirements on the position of any piers, and the width and height of span (both open and closed). The operational procedures will be influenced by the closure durations; it is not easy for large ships to abort manoeuvres on the Thames.

6.231. These requirements are unlikely to be insurmountable, but will entail both a costly engineering solution and operational procedures which are unfavourable to road traffic, due to the greater constraints on river movements related to ship movements on the tides etc.

Option D5 – achieving value for money

6.232. A lifting bridge of this scale is feasible, but has been described as at the limits of the technology, and so would be a costly solution. More importantly, the scheme benefits are unclear, given the potential for the scheme to create high levels of congestion, and associated environmental impacts, in the areas between the new crossing and the wider highway network, in both Woolwich and North Woolwich. These negative impacts will considerably offset the benefits for users of the crossing itself.

6.233. User charging at the new bridge would almost certainly be needed to provide a source of revenue to contribute towards the costs of construction; it would also help to manage the growth in demand which would otherwise occur with the shortening of journey times under this option.

6.234. Paying users would generally benefit from journey time savings with the introduction of a new bridge, although it would still represent a new charge to local motorists.

Option D5 – Programme objective summary

6.235. This option's performance against the objectives is set out in the table below.

		D5. Woolwich lift bridge
To improve the efficiency of the highway network in the London Thames Gateway, especially at river crossings, and provide greater resilience for all transport users	Peak Blackwall congestion	Moderate Positive
	Blackwall crossing resilience	Slight Positive
	Connectivity east of Greenwich	Moderate Positive
	Approach road independence	Slight Positive
	Local road reliability (Greenwich)	Neutral
	Local road reliability (Woolwich)	Moderate Negative
To support the needs of existing businesses in the area and to encourage new business investment	Local road reliability (Bexley)	Neutral
	Local road reliability (Royal Docks)	Moderate Negative
	JTs across sub-region (peak)	Slight Positive
	JTs across sub-region (off-peak)	Slight Positive
To support the provision of public transport services in the London Thames Gateway	Reliability of local buses	Slight Negative
	Allows new orbital public transport	Neutral
	Mode shift potential, car to public	Neutral
To integrate with local and strategic land use policies	Lower Lea Valley OA	Neutral
	Greenwich Peninsula OA	Slight Positive
	Royal Docks OA	Slight Positive
	London Riverside OA	Slight Positive
	Bexley Riverside OA	Neutral
	Thamesmead & Abbey Wood OA	Neutral
	Woolwich OA	Neutral
	Charlton Riverside OA	Neutral
To minimise the impacts of any proposals on health, safety and the environment	Health	Slight Positive
	Safety	Slight Positive
	Environment	Slight Negative
To ensure where possible that any proposals are acceptable in principle to key stakeholders, including affected boroughs	Local boroughs	Slight Negative
	Other stakeholders	Slight Negative
To achieve value for money	Business case	Neutral
	Wider economic benefits	Slight Positive
	Low cost for users	Moderate Negative
	CIL funding potential	Neutral
	Potential for user revenue to offset	Moderate Positive
	Capital cost	Moderate Negative

Assessment of Option D5 (Woolwich lifting bridge) – conclusion

6.236. Under Option D5, a lifting bridge would be built across the Thames at Woolwich.

6.237. This option has been assessed against the MTS goals and outcomes using SAF and the specific programme objectives.

Goal 1 – support economic development and population growth

6.238. The option performs positively against this goal overall, with the new bridge providing additional capacity and linking the North and South Circular roads.

Goal 2 – quality of life

6.239. The option performs negatively overall against this goal, with construction impacts on the river and regular congestion caused by shipping movements.

Goal 3 – safety and security

6.240. The option performs slightly positively against this goal, with the new crossing providing a full vehicle gauge route as an alternative to the Blackwall tunnel.

Goal 4 – transport opportunities

6.241. The option performs neutrally overall against this goal.

Goal 5 – climate change

6.242. The option performs negatively overall against this goal, with high levels of congestion caused by ship movements.

Goal 6 – support delivery of the London 2012 Olympic and Paralympic Games and its legacy

6.243. The option performs neutrally overall against this goal.

Programme objectives

6.244. A bridge at Woolwich would need to be at a very low level to allow the approach roads to tie into the roads on either side, but as a result the bridge would be regularly opening to shipping. There is very little queuing capacity, with problems occurring today with the ferry service; the increase in flow associated with a fixed link would mean that ship passes would result in rapid and severe congestion in the local area. This would have a negative impact on the local area, impacting on local people and businesses.

6.245. As a result of the above assessment and issues around feasibility, **a bridge at Woolwich is not recommended for further work**.

OPTION D6 – WOOLWICH TUNNEL

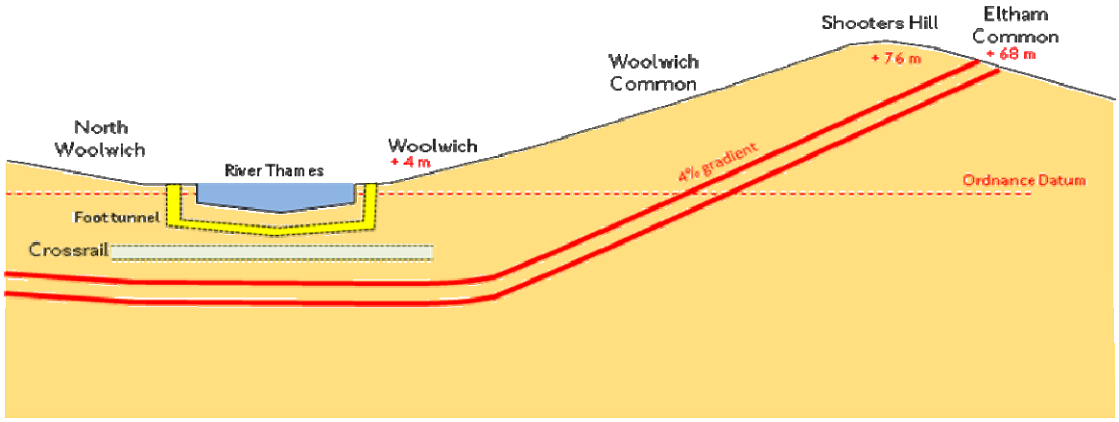
Option D6 – Option description

6.246. As an alternative to a lifting bridge, consideration has been given to constructing a North to South Circular connection by means of a tunnel, to avoid the resilience issues associated with a bridge, and taking traffic away from the congested road networks of Woolwich and North Woolwich.

6.247. There are a number of constraints in locating a tunnel in this area; key issues include the proximity of a town centre on the southern side, nearby residential development on both sides, presence of a foot tunnel below the Thames, the imminent construction of a Crossrail tunnel below the Thames, and other sub-surface infrastructure on both sides including the National Rail line through Woolwich, the DLR tunnel, and the ship entrance to the Royal Docks. These factors make a shallow tunnel infeasible, resulting in a deep bore tunnel, passing below the Thames, the foot tunnel, and Crossrail (as well as the other obstructions).

6.248. The land on the southern side rapidly rises up an escarpment, making it difficult to bring a deep tunnel to surface on the southern side. The schematic in the Figure below illustrates that a tunnel below Woolwich will not reach the surface for around 2 km from the Thames on the southern side. Given the bottleneck at Shooters Hill, the logical place for a portal is at Eltham Common, allowing South Circular traffic to by-pass the Shooters Hill crossroads.

Figure 5.25 – schematic tunnel long section

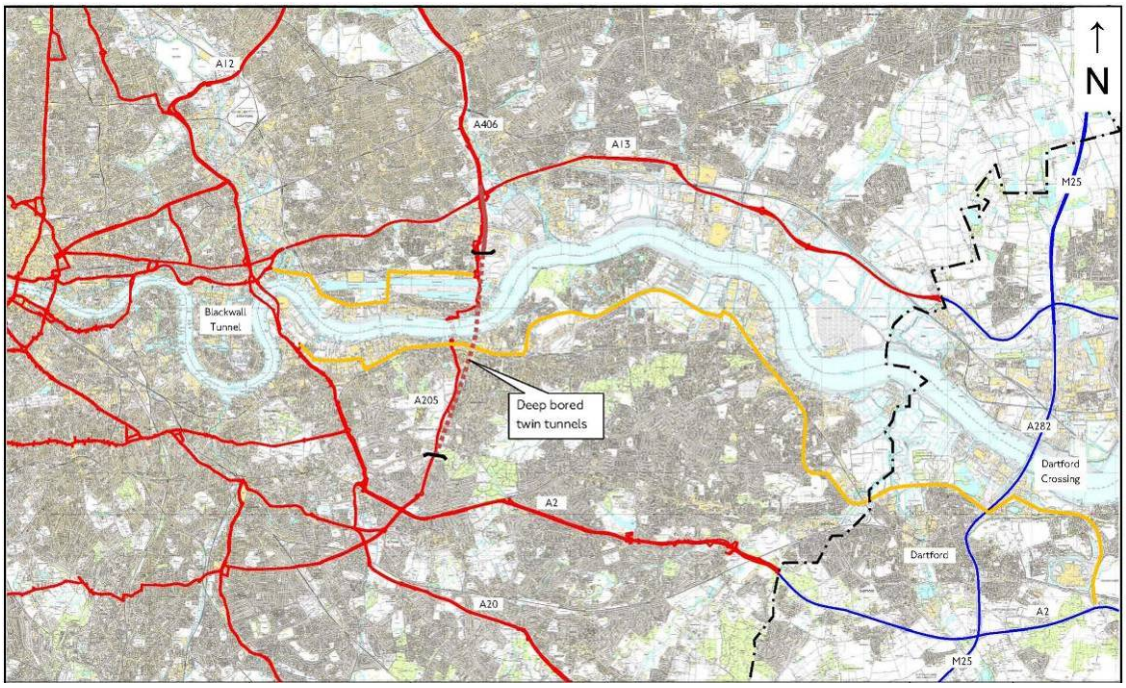


6.249. This option would thus have a portal in the Eltham Common area, passing below Shooters Hill, Woolwich, the River Thames and North Woolwich, with a portal likely in the Royal Docks Road area.

6.250. The length of tunnel would be 5-6 km, most likely twin-bore with cross-passages between the tunnels for intervention / escape. This would make this the longest road tunnel in the UK by some margin (the current longest tunnel is the 3.2 km Queensway tunnel in Merseyside). Due to the high safety risk posed by road junctions below ground, it is highly unlikely that any junctions could be built within the tunnel.

6.251. Figure 5.24 below illustrates the indicative alignment of this option.

Figure 5.26 – North to South Circular tunnel



Option D6 – Assessment against SAF

6.252. The table below summarises the option against the Strategic Assessment Framework.

MTS Challenges	MTS Outcomes	Qualitative Score	Comments
Goal 1: Support economic development and population growth			
Supporting sustainable population and employment growth	Balancing capacity and demand for travel through increasing public transport capacity	Slight Positive	New cross river link, although due to the required depth, it would by-pass the areas closest to the river. Could accomodate buses but would be a long section with no stops so unlikely to be much demand
	Balancing capacity and demand for travel through reducing the need to travel	Slight Positive	Toll could be used to manage peak demand - details are not yet worked through
Improving transport connectivity	Improving people's access to jobs	Slight Positive	Additional cross river link would improve access to jobs, but the link is between areas that are quite far apart
	Improving access to commercial markets for freight movements and business travel	Slight Positive	New cross river connection for HGVs, would be a fast link over a reasonable distance
Delivering an efficient and effective transport system for goods and people	Smoothing traffic flow (managing delay, improving journey time reliability and resilience)	Slight Negative	For certain trips it would reduce journey times, however, this would not be the case for people living or working near to the river, and also congestion at the south side would affect other road users
	Improving public transport reliability	Neutral	No impact
	Reducing operating costs	Moderate Positive	Operating costs would be offset by toll revenue
	Bringing and maintaining all assets to a state of good repair	Slight Positive	Replaces Woolwich ferry which is an elderly asset that is expensive to maintain
	Enhancing use of the Thames for people and goods	Slight Positive	New river crossing, it is not easily accessible by those nearest to the river however it would free up capacity on other links
Goal 2: Quality of Life			
Improving journey experience	Improving public transport customer satisfaction	Neutral	No impact
	Improving road user satisfaction (drivers, pedestrians, cyclists)	Slight Positive	New crossing
	Reducing public transport crowding	Neutral	No impact
Enhancing the built and natural environment	Enhancing streetscape, improving the perception of urban realm and developing 'better streets' initiatives	Slight Negative	Pedestrians and cyclists would be forced to use the Woolwich foot tunnel which is less pleasant than the ferry
	Protecting and enhancing the natural environment	Neutral	Under the river bed, minimal impact
Improving air quality	Reducing air pollutant emissions from ground based transport, contributing to EU air quality targets	Slight Positive	Reduced congestion and more resilient crossing would lead to reduced emissions, but tolling strategy would determine overall traffic volumes and therefore the wider congestion effect. Shorter average journey times
Improving noise impacts	Improving perceptions and reducing impacts of noise	Slight Negative	One section of the south circular would get a lot more traffic. Although this is already a busy road, it goes through a built up area and there would be more noise
Improving health impacts	Facilitating an increase in walking and cycling	Neutral	No impact
Goal 3: Safety and security			
Reducing crime, fear of crime and anti-social behaviour	Reducing crime rates (and improving perceptions of personal safety and security)	Neutral	No impact
Improving road safety	Reducing the numbers of road traffic casualties	Slight Positive	Full vehicle gauge crossing with modern safety features, would reduce the number of large vehicles using Blackwall. This would improve safety there and put those vehicles into a safer environment
Improving public transport safety	Reducing casualties on public transport networks	Neutral	No impact

Goal 4: Transport Opportunities			
Improving accessibility	Improving the physical accessibility of the transport system	Neutral	No impact
	Improving access to services	Slight Negative	Reduces cross river connectivity for people who live or work very near to the Thames, through the loss of the Woolwich ferry link
Supporting regeneration and tackling deprivation	Supporting wider regeneration	Slight Negative	Bypasses the South Thames Development Route (A206/A2016) which connects all the Opportunity Areas along the southern bank of the Thames in south east London, so it has a negative impact compared to the other options
Goal 5: Climate change			
Reducing CO_2 emissions	Reducing CO_2 emissions from ground based transport, contributing to a London-wide 60% reduction by 2025	Slight Positive	Reduced congestion and more resilient crossing would lead to reduced emissions, but tolling strategy would determine overall traffic volumes and therefore the wider congestion effect. Shorter average journey times
Adapting for climate change	Maintaining the reliability of transport networks	Moderate Positive	Additional fixed cross river link would improve resilience on the network
Goal 6: Support delivery of the London 2012 Olympic and Paralympics Games and its legacy			
Developing and implementing a viable and sustainable legacy for the 2012 Games	Supporting regeneration and convergence of social and economic outcomes between the five Olympic boroughs and the rest of London	Slight Positive	New cross river link in east London which would improve connectivity, however it would miss out areas closest to the Thames and there would be a toll
	Physical transport legacy	Neutral	No impact
	Behavioural transport legacy	Neutral	No impact
Deliverability and Risks		**Option 12**	
		Woolwich tunnel	
Issue	**Assessment Criteria**		
Deliverability and Acceptability Risks	Engineering feasibility risk	High	Would be the longest road tunnel in the UK
	Complexity of delivery (risk)	Medium	Bored tunnel would have impacts at the portals only
	Consent risk	Medium	Powers would be required
	Funding risk	High	No funding secured
	Stakeholder acceptability risk	Medium	Impact on community between tunnel and A2
	Public acceptability risk	Medium	Residents likely to oppose, as are businesses near the river who are overlooked by the new link
	Overall deliverability risk	High	
Complexity of operation	Operational feasibility risk	Low	Once operational, no new technology
Value for Money	Benefit Cost Ratio	Unknown	Not quantified
Affordability and Financial Sustainability	CAPEX	> £1bn	Estimate is £1.5 to £2 billion
	OPEX per annum	£2m < £5m	New tunnel management arrangement
	Revenue implications per annum	£10m < £50m	Cannot assume toll at Blackwall
	Funding potential within TfL budget	Low	No funding
	Funding potential with private finance, e.g. via S106, securitisation of revenue, and DfT	Low	No impact on development, so no possibility to secure funding
Timescales	Timescale for delivering the changes	Long-term	
	Program risk	High	

Option D6 – Assessment against programme objectives

Option D6 – improving the efficiency of the highway network

Peak congestion

6.253. The link between the tunnel and the A2 (Well Hall Road) would be difficult to upgrade as a high capacity connection to the new crossing as it is a residential road with homes on both sides, so any large increase in demand (driven by the fast new cross-river link) would be likely to result in congestion in this section, reducing the journey time benefits for cross-river traffic, as well as impacting on local traffic (including buses).

6.254. A user charging strategy would be helpful to aid management of traffic demand, although this is unlikely to be sufficient to mitigate against the traffic impacts likely to occur beyond the end of the tunnel.

Crossing resilience and network reliability

6.255. This link is some distance east of the Blackwall tunnel so gives a fairly good degree of independence and resilience. However this may be undermined if the link to the A2 cannot handle the volumes of traffic attracted.

Journey times

6.256. The link would be built with two lanes in each direction, and therefore have a high capacity of around 3,600 vehicles per hour per direction. However, the network feeding the link, particularly at the southern end, would limit the practical capacity; quite how much depends on what changes to the road network in the Eltham area would be acceptable.

6.257. Cross-river journey times would be excellent with such a link; however the capacity constraints at the southern end would be likely to reduce the journey time benefits. Furthermore, the crossing would not meet the local road networks in the Woolwich or Royal Docks area; therefore local traffic from the areas closest to the river would be unable to take advantage of the new link.

Option D6 – supporting the public transport network

6.258. A new road tunnel would provide the opportunity for local bus services to use the tunnel to make new orbital bus connections. However, with no access to the tunnel from close to the Thames (as it would pass deep below the river in tunnel), such services would need to operate non-stop over quite a long distance, such as from Well Hall (Eltham) to Beckton. This would limit the attractiveness of the new links, as those closest to the river (e.g. in Woolwich) would not be able to access any new services.

Option D6 – integrating with land use policies

6.259. Unlike most other river crossing options, this link would pass under the Thames at some depth, and would not connect to the highway network close to the river, and in

particular would not connect to the main east-west distributor road known as the South Thames Development Route (A206/A2016). This route connects all the Opportunity Areas along the southern bank of the Thames in south east London.

6.260. If the new crossing failed to connect to this route, as is the case with this option, the benefits to these OAs would be substantially reduced compared with an option serving these areas more directly.

Option D6 – impacts on health, safety and the environment

6.261. A tunnel at Woolwich would be bored due to the required depth. Due to the length of tunnel the construction impacts will be greater than a shorter tunnel. Whilst there will be benefits in terms of congestion relief, improved resilience at Blackwall and modal shift, these are unlikely to offset the impacts.

6.262. By providing a full vehicle gauge crossing linking the North and South Circular roads, it would reduce the volumes of large vehicles using the Blackwall tunnel, which would improve the safety of the Blackwall tunnel.

Option D6 – borough and other stakeholder views

6.263. The views of stakeholders have not been sought regarding this option. However it is highly likely that the option would attract strong opposition from the residents who would be impacted by the link between the tunnel and the A2. The option would not serve the riverside Opportunity Areas due to the depth of tunnel, and therefore opposition from residents is unlikely to be offset by support from business in the Opportunity Areas.

6.264. The land impacts of this scheme would be minimal for the most part, with space at the northern end available within the area safeguarded for a crossing, and most of the route in deep tunnel. However, at the southern end the route would surface in a residential area; detailed design work would be necessary to understand in detail the land and property implications, but it seems unlikely that the scheme could be built without negatively impacting on the housing lining the A205 through Eltham.

Option D6 – achieving value for money

6.265. This option would involve up to 6 km of bored tunnel; no engineering assessments have been made, but the cost would be very high compared with shorter crossing options, likely in the order of £1.5 to £2 billion.

6.266. User charging at the new tunnel would almost certainly be needed to provide a source of revenue to contribute towards the costs of construction; it would also help to manage the growth in demand which would otherwise occur with the shortening of journey times under this option.

Option D6 – Programme objective summary

6.267. The table below summarises the option against the current river crossing programme objectives.

		D6. Woolwich tunnel
To improve the efficiency of the highway network in the London Thames Gateway, especially at river crossings, and provide greater resilience for all transport users	Peak Blackwall congestion	Moderate Positive
	Blackwall crossing resilience	Slight Positive
	Connectivity east of Greenwich	Moderate Positive
	Approach road independence	Slight Positive
	Local road reliability (Greenwich)	Slight Positive
	Local road reliability (Woolwich)	Moderate Positive
To support the needs of existing businesses in the area and to encourage new business investment	Local road reliability (Bexley)	Slight Positive
	Local road reliability (Royal Docks)	Moderate Positive
	JTs across sub-region (peak)	Moderate Positive
	JTs across sub-region (off-peak)	Moderate Positive
To support the provision of public transport services in the London Thames Gateway	Reliability of local buses	Slight Positive
	Allows new orbital public transport	Slight Positive
	Mode shift potential, car to public	Neutral
To integrate with local and strategic land use policies	Lower Lea Valley OA	Neutral
	Greenwich Peninsula OA	Slight Positive
	Royal Docks OA	Slight Positive
	London Riverside OA	Slight Positive
	Bexley Riverside OA	Neutral
	Thamesmead & Abbey Wood OA	Neutral
	Woolwich OA	Neutral
	Charlton Riverside OA	Neutral
To minimise the impacts of any proposals on health, safety and the environment	Health	Neutral
	Safety	Slight Positive
	Environment	Slight Negative
To ensure where possible that any proposals are acceptable in principle to key stakeholders, including affected boroughs	Local boroughs	Slight Negative
	Other stakeholders	Slight Negative
To achieve value for money	Business case	Neutral
	Wider economic benefits	Neutral
	Low cost for users	Moderate Negative
	CIL funding potential	Neutral
	Potential for user revenue to offset	Slight Positive
	Capital cost	Strong Negative

Assessment of Option D6 (Woolwich tunnel) – conclusion

6.268. Under Option D6, a tunnel would be built between the North and South Circular Roads below the Thames at Woolwich.

6.269. This option has been assessed against the MTS goals and outcomes using SAF and the specific programme objectives.

Goal 1 – support economic development and population growth

6.270. The option performs positively against this goal overall, with the new tunnel providing additional capacity and linking the North and South Circular roads.

Goal 2 – quality of life

6.271. The option performs neutrally overall against this goal, with benefits to tunnel users of faster journey times but impacts on communities close to connecting roads.

Goal 3 – safety and security

6.272. The option performs slightly positively against this goal, with the new crossing providing a full vehicle gauge route as an alternative to the Blackwall tunnel.

Goal 4 – transport opportunities

6.273. The option performs slightly negatively overall against this goal, as the crossing would by-pass the riparian Opportunity Areas, which are assumed to lose the Woolwich ferry under this option.

Goal 5 – climate change

6.274. The option performs positively overall against this goal, with shorter journeys and lower congestion, provided that tolling is used to manage traffic levels.

Goal 6 – support delivery of the London 2012 Olympic and Paralympic Games and its legacy

6.275. The option performs slightly positively overall against this goal, with better connectivity across the Thames in the east sub-region.

Programme objectives

6.276. This option performs well against the highway network objectives, as it would provide a direct link between the North and South Circular Roads, significantly reducing journey times along this orbital corridor, and relieving traffic at the Blackwall Tunnel.

6.277. However, it is not clear whether it would be possible for the section between the new tunnel and the A2 to be upgraded sufficiently to take advantage of the new cross-river connection. Moreover, no connections would be made with the South Thames Development Route which serves the Opportunity Areas along the southern side of the Thames. The cost of tunnelling for around 5-6 km including below the Thames would be very significant indeed, while not providing clear benefits to the Opportunity Areas along the southern side of the Thames.

6.278. In conclusion **it is recommended that this option is not pursued further**.

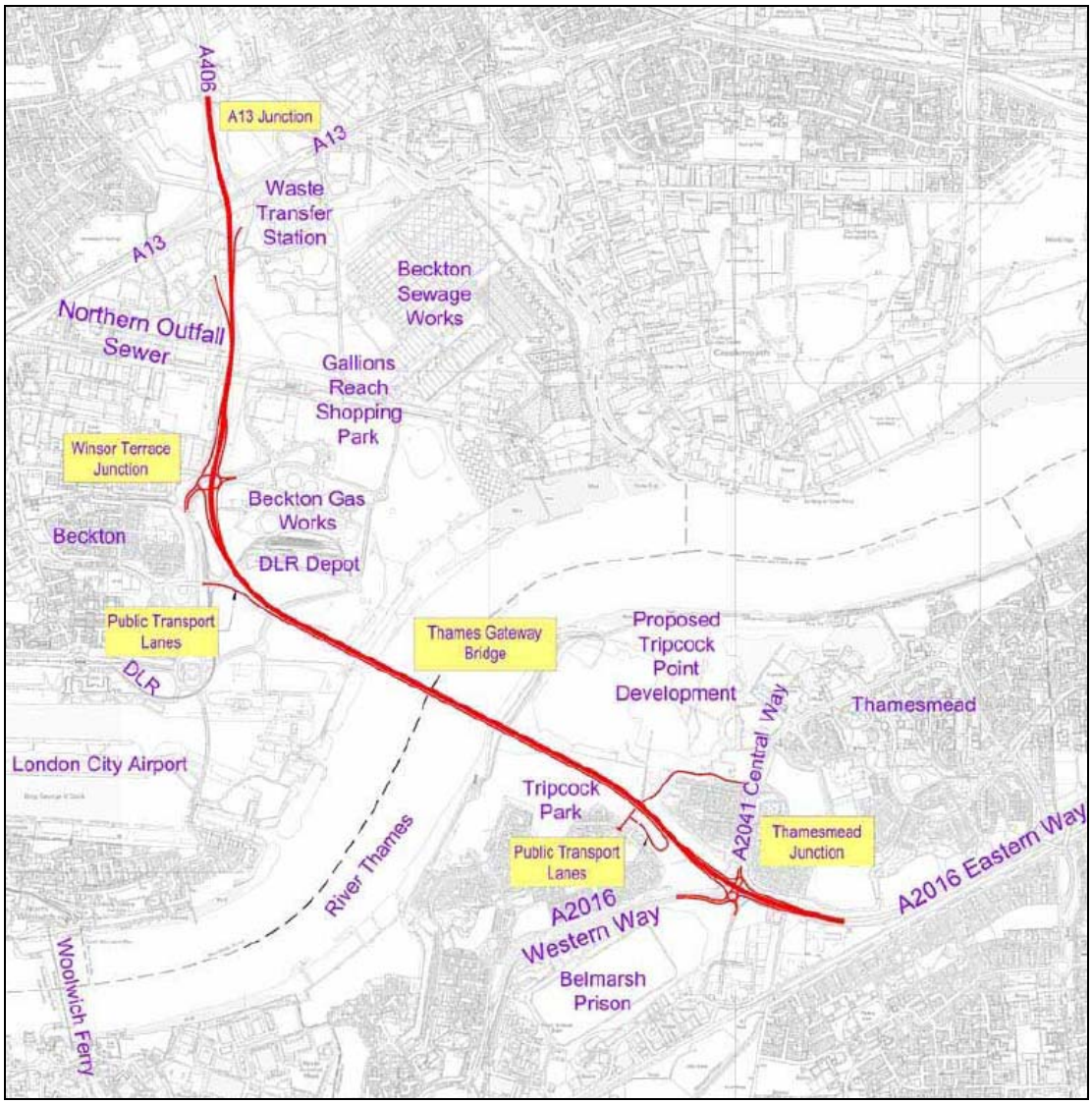
OPTION D7 – THAMES GATEWAY BRIDGE AT GALLIONS REACH

Option D7 – Option description

6.279. TfL previously proposed a bridge at Gallions Reach; called the Thames Gateway Bridge (TGB), this would have been a dual-carriageway from Western Way in Thamesmead to the North Circular at the A13, and incorporated a busway linking Thamesmead to Gallions Reach DLR station.

6.280. The scheme is illustrated in the Figure below.

Figure 5.27 - Former Thames Gateway Bridge (TGB) scheme



6.281. The bridge was designed to operate as a tolled crossing, with users paying a charge to cross the bridge. Discounted tolls were proposed for those living within a defined zone close to the crossing on either side of the Thames.

6.282. The bridge was supported by some key stakeholders, including the boroughs of Greenwich and Newham, within which the proposed crossing would have been built.

6.283. However, it was opposed by the London Borough of Bexley, which lies close to the southern end of the bridge.

Option D7 – Assessment against SAF

6.284. The table below summarises the option against the Strategic Assessment Framework.

MTS Challenges	MTS Outcomes	Qualitative Score	Comments
Goal 1: Support economic development and population growth			
Supporting sustainable population and employment growth	Balancing capacity and demand for travel through increasing public transport capacity	Moderate Positive	Additional river crossing for vehicles, also it enables new cross river bus links with a dedicated busway
	Balancing capacity and demand for travel through reducing the need to travel	Slight Positive	Toll could be used to manage peak demand - details are not yet worked through
Improving transport connectivity	Improving people's access to jobs	Moderate Positive	Additional cross river link would improve access to jobs
	Improving access to commercial markets for freight movements and business travel	Strong Positive	Additional cross river link, suitable for HGVs, provides a new route for freight movements
Delivering an efficient and effective transport system for goods and people	Smoothing traffic flow (managing delay, improving journey time reliability and resilience)	Moderate Positive	As an alternative to the existing Woolwich ferry, this scheme would generate huge journey time savings and improve reliability through being useable in almost all weather conditions and not liable to mechanical failure
	Improving public transport reliability	Slight Negative	Any new bus routes would be reliable due to the dedicated busway. Traffic congestion on the south side of the river could have a negative impact on existing services
	Reducing operating costs	Moderate Positive	Operating costs would be offset by toll revenue
	Bringing and maintaining all assets to a state of good repair	Slight Positive	Replaces Woolwich ferry which is currently difficult to maintain
	Enhancing use of the Thames for people and goods	Strong Positive	Additional river crossing for vehicles, also it enables new cross river bus links
Goal 2: Quality of Life			
Improving journey experience	Improving public transport customer satisfaction	Moderate Positive	Potential for improvements to local cross river bus connectivity and dedicated busway to ensure reliability
	Improving road user satisfaction (drivers, pedestrians, cyclists)	Moderate Positive	Improved journey time for cross river trips, offset by congestion on south side of river, and the toll
	Reducing public transport crowding	Neutral	No impact
Enhancing the built and natural environment	Enhancing streetscape, improving the perception of urban realm and developing 'better streets' initiatives	Moderate Negative	Visual intrusion, and pedestrians and cyclists would be forced to use the Woolwich foot tunnel which is less pleasant than the ferry
	Protecting and enhancing the natural environment	Moderate Negative	Large piers in Thames would have an impact on the river, also construction of new road
Improving air quality	Reducing air pollutant emissions from ground based transport, contributing to EU air quality targets	Slight Positive	Reduced congestion and more resilient crossing would lead to reduced emissions, but tolling strategy would determine overall traffic volumes and therefore the wider congestion effect. Shorter average journey times
Improving noise impacts	Improving perceptions and reducing impacts of noise	Slight Negative	Increased traffic and congestion in built up residential areas
Improving health impacts	Facilitating an increase in walking and cycling	Slight Positive	Bridge would provide a new cross river link for pedestrians and cyclists so would increase trip numbers for these modes
Goal 3: Safety and security			
Reducing crime, fear of crime and anti-social behaviour	Reducing crime rates (and improving perceptions of personal safety and security)	Neutral	No impact
Improving road safety	Reducing the numbers of road traffic casualties	Slight Positive	Full vehicle gauge crossing with modern safety features, would reduce the number of large vehicles using Blackwall. This would improve safety there and put those vehicles into a safer environment
Improving public transport safety	Reducing casualties on public transport networks	Neutral	No impact

Goal 4: Transport Opportunities			
Improving accessibility	Improving the physical accessibility of the transport system	Slight Positive	Potential for new cross river bus links, which would be fully accessible
	Improving access to services	Slight Positive	Would allow new cross river bus links
Supporting regeneration and tackling deprivation	Supporting wider regeneration	Moderate Positive	New pedestrian and cycle link would generate more trips, links to London Plan growth areas
Goal 5: Climate change			
Reducing CO_2 emissions	Reducing CO_2 emissions from ground based transport, contributing to a London-wide 60% reduction by 2025	Slight Positive	Reduced congestion and more resilient crossing would lead to reduced emissions, but tolling strategy would determine overall traffic volumes and therefore the wider congestion effect. Shorter average journey times
Adapting for climate change	Maintaining the reliability of transport networks	Moderate Positive	Additional fixed cross river link would improve resilience on the network
Goal 6: Support delivery of the London 2012 Olympic and Paralympics Games and its legacy			
Developing and implementing a viable and sustainable legacy for the 2012 Games	Supporting regeneration and convergence of social and economic outcomes between the five Olympic boroughs and the rest of London	Moderate Positive	New cross river link in east London which would improve connectivity and is excellent for regeneration, however there would be a toll
	Physical transport legacy	Neutral	No impact
	Behavioural transport legacy	Neutral	No impact

Deliverability and Risks		**Option 13**	
		Thames Gateway bridge	
Issue	**Assessment Criteria**		
Deliverability and Acceptability Risks	Engineering feasibility risk	Medium	Design has been worked through to a good level of detail, but would need to be revisited
	Complexity of delivery (risk)	Medium	Complex building in the river, however river would remain navigable
	Consent risk	High	Powers required, scheme has previously failed to secure powers
	Funding risk	High	No funding secured
	Stakeholder acceptability risk	High	LB Bexley strongly against, other boroughs support
	Public acceptability risk	Medium	Congestion on south side of river
	Overall deliverability risk	High	
Complexity of operation	Operational feasibility risk	Low	Once operational, no new technology
Value for Money	Benefit Cost Ratio	> 4	Approximately 5.9 to 1
Affordability and Financial Sustainability	CAPEX	£500m <£1bn	£570m, £800m in outturn prices
	OPEX per annum	£2m < £5m	New bridge management arrangement
	Revenue implications per annum	£10m < £50m	Cannot assume toll at Blackwall
	Funding potential within TfL budget	Low	No funding
	Funding potential with private finance, e.g. via S106, securitisation of revenue, and DfT	Low	No impact on development, so no possibility to secure funding
Timescales	Timescale for delivering the changes	Long-term	
	Program risk	High	

Option D7 – Assessment against programme objectives

Option D7 – improving the efficiency of the highway network

Peak congestion

6.285. The modelling for TGB suggested that it would provide relief for the Blackwall tunnel as well as opening up new travel opportunities further to the east. However, a key issue is that the road network on the southern side is much less developed than on the northern side, where the road would meet the grade separated A406 and A13 as well as linking (via the A406) to the M11.

6.286. To the south, the road would meet the east-west South Thames Development Route, a useful distributor road along the southern side of the Thames, but this is lower capacity than the northern access routes, and is generally not grade separated, with congested junctions in Plumstead, Woolwich and Erith.

6.287. Other routes on the southern side are poorer still, with the roads south into Bexley being largely two lane single carriageway roads, fronted by suburban housing. There was some strong local opposition to the scheme arising from concerns over the impacts in these areas. This led ultimately to the opposition of the London Borough of Bexley to the scheme.

Crossing resilience and network reliability

6.288. In the event of congestion at either Dartford or Blackwall crossings, there is a likelihood that a new fixed link at Gallions Reach would attract traffic diverted from those crossings. Given that TGB would not directly link into the main London-wide road network (for example the A2), the local road network has only limited potential to accommodate such traffic, in particular on the southern side.

Journey times

6.289. The Thames Gateway Bridge would have two general traffic lanes in each direction, with a capacity of around 3,600 vehicles per hour. In addition, there would be a busway alongside the main road.

6.290. The road would be fast, and although it was planned as a tolled crossing, it would have no toll collection plazas, so journey times for cross-river trips in the area would reduce considerably.

Option D7 – supporting the public transport network

6.291. The Thames Gateway Bridge proposal included provision for a segregated busway, allowing new orbital bus services to connect the communities on either side of the Thames. While the free-flow nature of the tolling would have meant that congestion on the bridge would be very unlikely, the busway allowed the scheme to effectively link in with previous proposals for segregated busways on either side, providing reliable journey times for such buses.

Option D7 – integrating with land use policies

6.292. The TGB scheme would provide much greater access to the Docklands and central London markets for business in the north Bexley/north Greenwich areas, as well as greatly improved access to the main road network north of the Thames. It would also relieve congestion at the Blackwall tunnel. As such, the regeneration impacts of the scheme are strong, particularly in the Bexley and Greenwich areas of south east London. It would also improve access from parts of east London, such as the Royal Docks, to the M25, Kent and the channel ports, avoiding the Dartford Crossing.

6.293. There is some risk however that congestion on the routes in the south – such as the corridor through Erith – could cause some knock-on negative impacts on these areas; these effects would need to be tested carefully and mitigation considered.

Option D7 – impacts on health, safety and the environment

6.294. A bridge would require large piers in the River Thames and so would have an impact upon the river. Considerable work was undertaken by TfL with the key bodies responsible for the river, such as the Port of London Authority and Environment Agency, to identify an acceptable design and methodology to minimise any impacts but these would need to be revisited. The bridge may also have a visual and a local air quality impact. Whilst there will be an environmental benefit resulting from reduction in congestion in certain locations, on balance, this is insufficient to offset the adverse impact.

6.295. A bridge at Gallions would provide a pedestrian and cycle crossing and therefore it will have a positive impact on health.

6.296. By providing a full vehicle gauge crossing, it would reduce the volumes of large vehicles using the Blackwall tunnel, which would improve the safety of the Blackwall tunnel; however being several kilometres downstream the effects are minor compared with closer crossings.

Option D7 – borough and other stakeholder views

6.297. There are starkly opposing views regarding TGB form the key stakeholders. Several stakeholders, including the boroughs of Greenwich and Newham within which the scheme lies, strongly support TGB, and see the crossing as a key infrastructure requirement to realise the full development potential of this part of the Thames Gateway.

6.298. However the London Borough of Bexley, which has concerns about the traffic generation and distribution on residential borough roads, opposes TGB on traffic grounds and objected at the previous Public Inquiry on the scheme.

6.299. As a result of these objections, the Mayor's 2008 transport manifesto[4] recognised this concern, stating:

> *"I support in principle the need for an extra river crossing upstream* [should read "downstream"] *from Tower Bridge to ease congestion and aid economic growth. However, any scheme will have to deal with the issues on both sides of the river in terms of traffic management, safeguarding the environment and public transport*

[4] Getting Londoners Moving, Boris Johnson's transport manifesto, 2008

usage. The current scheme for a Thames Gateway Bridge does not currently fulfil these criteria; therefore I do not support the scheme in its present form."

6.300. Following the 2008 London election, the Mayor confirmed that he would not progress the Thames Gateway Bridge.

6.301. Since 2008, LB Bexley have re-confirmed their opposition to TGB, stating in their response to the draft revised Mayor's Transport Strategy[5] in 2010:

"We welcome the Mayor's intention to progress a package of river crossings in east London, in consultation with the relevant London boroughs. However, we're concerned that this includes consideration for a longer-term fixed link at Gallions Reach. This borough is opposed to any such fixed link crossing at this location."

6.302. As a result of this opposition, the Mayor remains opposed to TGB. In 2012, the Mayor reaffirmed his opposition in his election manifesto:

"I killed off my predecessor's proposal for a Thames Gateway Bridge because of the damaging impact it would have had on Bexley, and I will not resuscitate it."

Option D7 – achieving value for money

6.303. The potential costs for the TGB scheme were revisited by TfL's consultants in 2012 to provide an update to the costs since the scheme's cancellation, and to take account of construction price inflation in the intervening time.

6.304. The base cost of the scheme is expected to be around £500 million (current prices, excluding risk). With other additional costs for land, design, site investigation, construction supervision, future inflation and risk this would be likely to rise to around £800 million in outturn prices.

6.305. The large shortening of journey times resulting from a new bridge at this location generates large benefits and a positive business case.

6.306. User charging at the new bridge would almost certainly be needed to provide a source of revenue to contribute towards the costs of construction; it would also help to manage the growth in demand which would otherwise occur with the shortening of journey times under this option.

[5] Letter from Cllr Peter Craske to Mayor Boris Johnson, 12 January 2011 incl attachments

Option D7 – Programme objective summary

6.307. This option's performance against the objectives is set out in the table below.

		D7. TGB at Gallions
To improve the efficiency of the highway network in the London Thames Gateway, especially at river crossings, and provide greater resilience for all transport users	Peak Blackwall congestion	Moderate Positive
	Blackwall crossing resilience	Slight Positive
	Connectivity east of Greenwich	Strong Positive
	Approach road independence	Slight Positive
	Local road reliability (Greenwich)	Slight Positive
	Local road reliability (Woolwich)	Slight Positive
To support the needs of existing businesses in the area and to encourage new business investment	Local road reliability (Bexley)	Moderate Negative
	Local road reliability (Royal Docks)	Moderate Positive
	JTs across sub-region (peak)	Moderate Positive
	JTs across sub-region (off-peak)	Moderate Positive
To support the provision of public transport services in the London Thames Gateway	Reliability of local buses	Moderate Positive
	Allows new orbital public transport	Moderate Positive
	Mode shift potential, car to public	Neutral
To integrate with local and strategic land use policies	Lower Lea Valley OA	Neutral
	Greenwich Peninsula OA	Slight Positive
	Royal Docks OA	Moderate Positive
	London Riverside OA	Moderate Positive
	Bexley Riverside OA	Moderate Positive
	Thamesmead & Abbey Wood OA	Moderate Positive
	Woolwich OA	Slight Positive
	Charlton Riverside OA	Slight Positive
To minimise the impacts of any proposals on health, safety and the environment	Health	Slight Positive
	Safety	Slight Positive
	Environment	Slight Negative
To ensure where possible that any proposals are acceptable in principle to key stakeholders, including affected boroughs	Local boroughs	Slight Negative
	Other stakeholders	Moderate Positive
To achieve value for money	Business case	Moderate Positive
	Wider economic benefits	Moderate Positive
	Low cost for users	Moderate Negative
	CIL funding potential	Moderate Positive
	Potential for user revenue to offset	Moderate Positive
	Capital cost	Strong Negative

Assessment of Option D7 (Thames Gateway Bridge) – conclusion

6.308. Under Option D7, the Thames Gateway Bridge would be built between Beckton and Thamesmead at Gallions Reach.

6.309. This option has been assessed against the MTS goals and outcomes using SAF and the specific programme objectives.

Goal 1 – support economic development and population growth

6.310. The option performs positively against this goal overall, with the new bridge providing additional capacity and fast link across the Thames within Opportunity Areas.

Goal 2 – quality of life

6.311. The option performs neutrally overall against this goal, with benefits to bridge users of better cross-river links and faster journey times but potential for traffic impacts on local communities and on the river.

Goal 3 – safety and security

6.312. The option performs slightly positively against this goal, with the new crossing providing a full vehicle gauge route as an alternative to the Blackwall tunnel.

Goal 4 – transport opportunities

6.313. The option performs positively overall against this goal, with the potential for bus services to provide a number of new cross-river journey opportunities.

Goal 5 – climate change

6.314. The option performs positively overall against this goal, with shorter journeys and lower congestion, provided that tolling is used to manage traffic levels.

Goal 6 – support delivery of the London 2012 Olympic and Paralympic Games and its legacy

6.315. The option performs slightly positively overall against this goal, with better connectivity across the Thames in the east sub-region.

Programme objectives

6.316. The Thames Gateway Bridge meets several of the MTS and programme objectives, because it would provide a new link, with a significant improvement to local journey times (provided that traffic demand is managed sufficiently that the new crossing does not generate significant levels of new traffic).

6.317. However, the very significant stakeholder acceptability issue remains; while some boroughs are very supportive of the scheme, the London Borough of Bexley is strongly opposed to TGB and would be likely to oppose any applications for powers, and the Mayor opposed its construction in his manifesto.

6.318. As a result of the opposition to the scheme from one of the key boroughs and the Mayor of London, **the Thames Gateway Bridge is not recommended for further work**.

OPTION D8 – LOCAL BRIDGE AT GALLIONS REACH

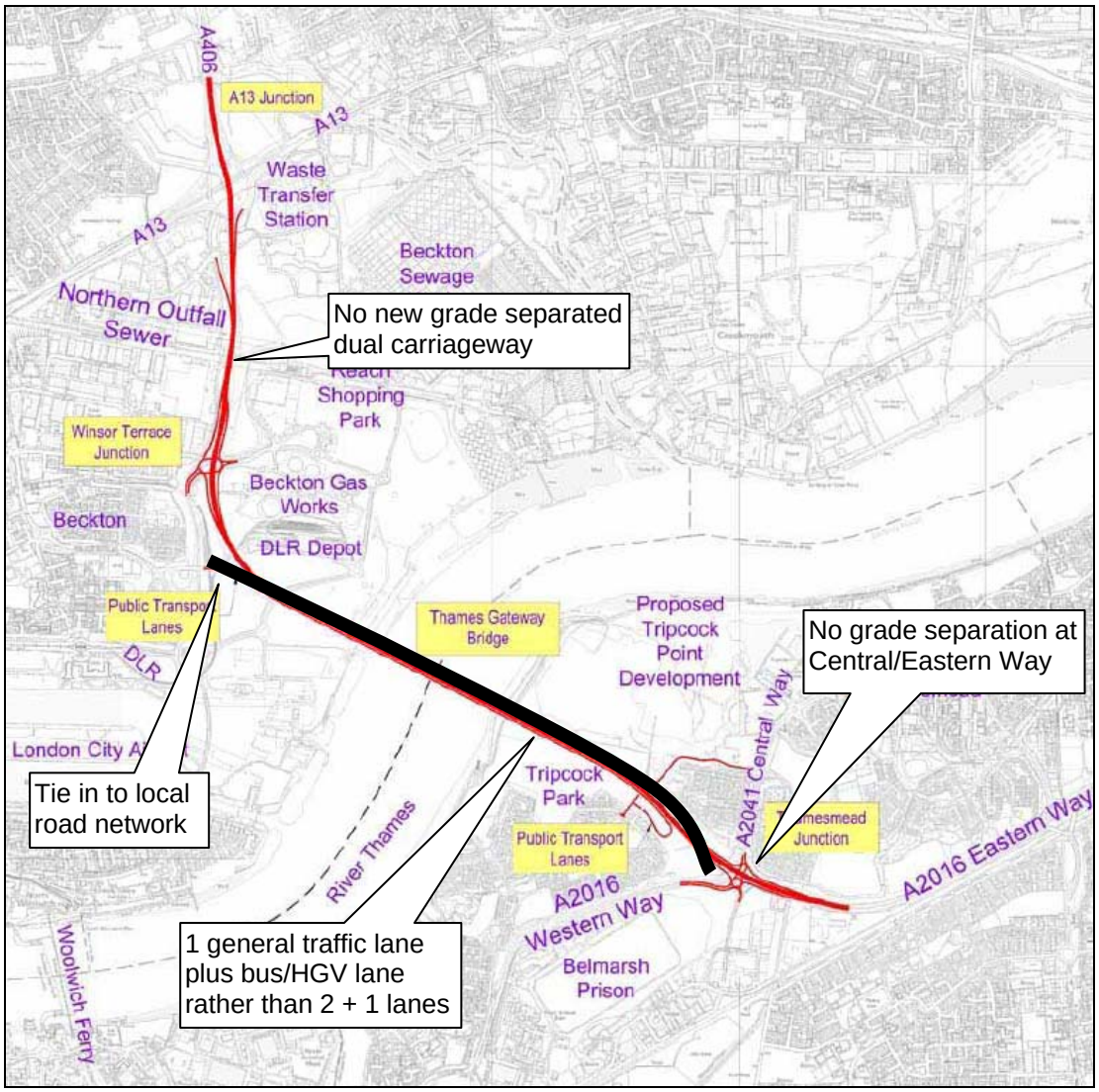
Option D8 – Option description

6.319. The Mayor has very clearly ruled out the Thames Gateway Bridge project, a single new crossing comprising a high capacity bridge at Gallions Reach and direct connections to the A406, because of the traffic impacts on certain areas and the likelihood of objections from a statutory stakeholder, the London Borough of Bexley.

6.320. However, if a road crossing at Silvertown were progressed to address the problems at the Blackwall tunnel, a smaller scale bridge at Gallions Reach than the previous TGB scheme may be able to deliver the connectivity benefits without the traffic impacts which were unacceptable locally. Such a crossing would also be significantly cheaper to construct.

6.321. In addition, if the resilience of existing crossings has been addressed by the construction of the Silvertown tunnel to provide resilience at Blackwall, and the government proceeds with its higher tolls, free-flow tolling and planned new Lower Thames Crossing to relieve Dartford, the risk of strategic traffic being attracted to a fixed link in this location would be much reduced, and so a fixed link could potentially be more acceptable locally.

Figure 5.28 – potential local bridge at Gallions Reach (shown in black over TGB scheme in red)



6.322. The Figure above illustrates how a bridge utilising the same point in the river could be built to a smaller scale than the former TGB scheme. However key TGB parameters will need to be respected (and agreed with the PLA) to maintain navigability of the river, including a clearance height of around 50 metres, and a long span of around 290 metres.

6.323. It would have a more local connection at the southern end without grade separation to Eastern Way, and at the northern end the new dual carriageway alongside Royal Docks Road would not be built, with the crossing tying into the local road network close to Gallions Roundabout. (Although some wider traffic works could prove necessary, such as a flyover over the A13.)

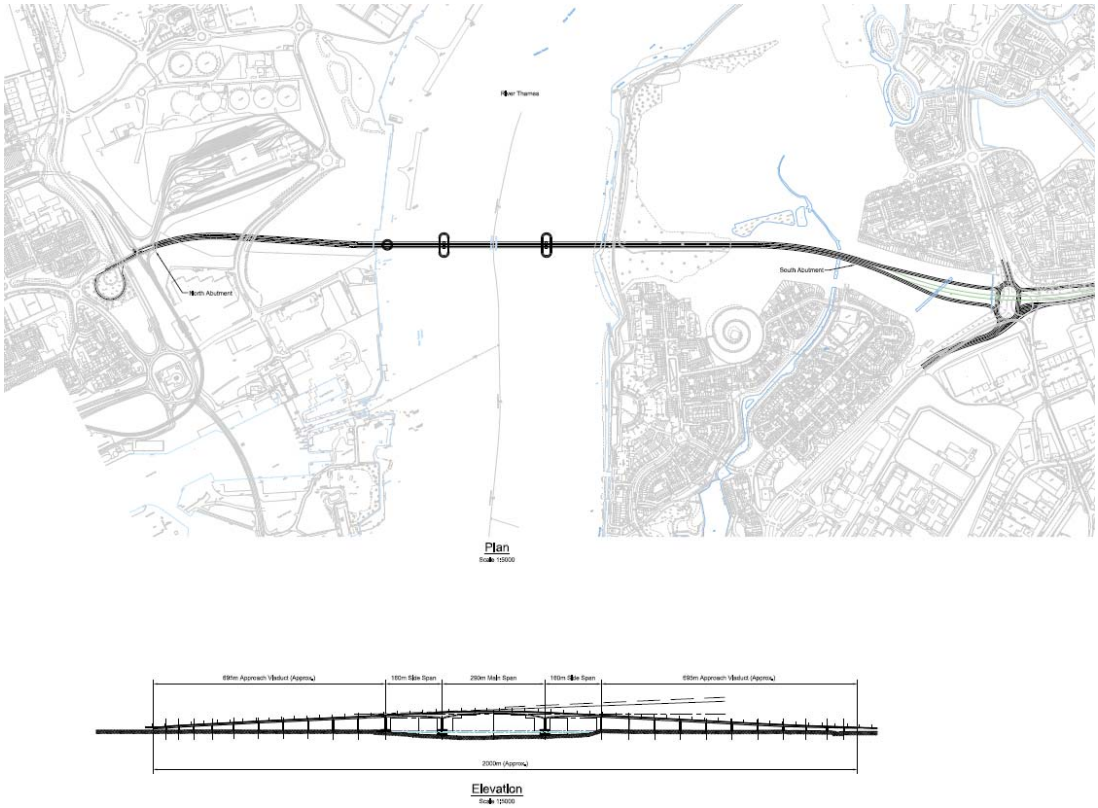
6.324. In the longer term, any fixed link provides the potential for the highway connections to be amended or improved over time, to best suit the prevailing traffic and regeneration needs of the area. For example, the connections to the strategic network could be improved in the long term, such as through the provision of a direct link to the North Circular together with a tunnel south to the A2. This could potentially address the local concerns about traffic on residential roads in Bexley by

providing an effective by-pass, while delivering large journey time benefits to the wider area by providing a more easterly strategic orbital route. In time this could replace the Blackwall corridor as the main strategic route, and deliver benefits to regeneration in the Lower Lea Valley.

6.325. Two lanes in each direction should be built, allowing slower large vehicles climbing up the long gradient to be passed by other traffic. However, it would also be highly desirable for buses to be protected from any congestion. It is therefore assumed that the bridge would be managed with a bus and goods vehicle lane in each direction as well as a general traffic lane.

6.326. Note that while the option is assessed here in isolation, this option is likely to be feasible only in the event that a Silvertown crossing is also provided; without a crossing at Silvertown, the single lane arrangement is likely to be difficult to achieve, and the crossing would become very similar to the previous TGB proposal.

Figure 5.29 – Indicative alignment of a local bridge crossing



6.327. The form of structure is highly likely to be similar to the concrete deck proposed for TGB (albeit not as wide, and shorter approach viaducts) because of the constraints on structures imposed by the proximity of City Airport;

6.328. The large central span would be at the limit of what has been constructed elsewhere in the world for this form of structure and will require cutting edge technology in design and construction.

6.329. There is some potential for a lower cost bridge with one lane each way but there are operational and safety issues with only a single lane in each direction. It would be possible to convert this into a two lane dual crossing later but at a higher overall cost than a single stage scheme offering the same capacity.

6.330. There are three key differences between this option and the former TGB scheme:

(i) the highway connections would be local rather than strategic, and therefore less likely to attract strategic traffic;

(ii) the crossing would have two lanes in each direction, one of which would be a priority lane for buses and possibly other large vehicles, whereas TGB had two general traffic lanes in each direction as well as a busway;

(iii) the option could be built together with the Silvertown crossing, with the latter providing the resilient route for strategic Blackwall traffic which under the former TGB scheme would have diverted to TGB.

Option D8 – Assessment against SAF

6.331. The table below summarises the option against the Strategic Assessment Framework.

MTS Challenges	MTS Outcomes	Qualitative Score	Comments
Goal 1: Support economic development and population growth			
Supporting sustainable population and employment growth	Balancing capacity and demand for travel through increasing public transport capacity	Moderate Positive	Additional river crossing for vehicles, also it enables new cross river bus links with a dedicated busway
	Balancing capacity and demand for travel through reducing the need to travel	Slight Positive	Toll could be used to manage peak demand - details are not yet worked through
Improving transport connectivity	Improving people's access to jobs	Moderate Positive	Additional cross river link would improve access to jobs
	Improving access to commercial markets for freight movements and business travel	Moderate Positive	Additional cross river link, suitable for HGVs, provides a new route for freight movements. Less of a strategic link than TGB
Delivering an efficient and effective transport system for goods and people	Smoothing traffic flow (managing delay, improving journey time reliability and resilience)	Moderate Positive	As an alternative to the existing Woolwich ferry, this scheme would generate huge journey time savings and improve reliability through being useable in almost all weather conditions and not liable to mechanical failure
	Improving public transport reliability	Neutral	Any new bus routes would be reliable due to the dedicated busway, no impact on existing services
	Reducing operating costs	Moderate Positive	Operating costs would be offset by toll revenue
	Bringing and maintaining all assets to a state of good repair	Slight Positive	Replaces Woolwich ferry which is currently difficult to maintain
	Enhancing use of the Thames for people and goods	Strong Positive	Additional river crossing for vehicles, also it enables new cross river bus links
Goal 2: Quality of Life			
Improving journey experience	Improving public transport customer satisfaction	Slight Positive	Potential for improvements to local cross river bus connectivity
	Improving road user satisfaction (drivers, pedestrians, cyclists)	Moderate Positive	Improved journey time and reduced congestion at Blackwall, however, there would be a toll
	Reducing public transport crowding	Neutral	No impact
Enhancing the built and natural environment	Enhancing streetscape, improving the perception of urban realm and developing 'better streets' initiatives	Moderate Negative	Visual intrusion, and pedestrians and cyclists would be forced to use the Woolwich foot tunnel which is less pleasant than the ferry
	Protecting and enhancing the natural environment	Moderate Negative	Large piers in Thames would have an impact on the river, also construction of new road
Improving air quality	Reducing air pollutant emissions from ground based transport, contributing to EU air quality targets	Slight Positive	Reduced congestion and more resilient crossing would lead to reduced emissions, but tolling strategy would determine overall traffic volumes and therefore the wider congestion effect. Shorter average journey times
Improving noise impacts	Improving perceptions and reducing impacts of noise	Slight Negative	Increased traffic in built up residential areas
Improving health impacts	Facilitating an increase in walking and cycling	Slight Positive	Bridge would provide a new cross river link for pedestrians and cyclists so would increase trip numbers for these modes
Goal 3: Safety and security			
Reducing crime, fear of crime and anti-social behaviour	Reducing crime rates (and improving perceptions of personal safety and security)	Neutral	No impact
Improving road safety	Reducing the numbers of road traffic casualties	Slight Positive	Full vehicle gauge crossing with modern safety features, would reduce the number of large vehicles using Blackwall. This would improve safety there and put those vehicles into a safer environment
Improving public transport safety	Reducing casualties on public transport networks	Neutral	No impact

Goal 4: Transport Opportunities			
Improving accessibility	Improving the physical accessibility of the transport system	Slight Positive	Potential for new cross river bus links, which would be fully accessible
	Improving access to services	Slight Positive	Would allow new cross river bus links
Supporting regeneration and tackling deprivation	Supporting wider regeneration	Moderate Positive	New pedestrian and cycle link would generate more trips, links to London Plan growth areas
Goal 5: Climate change			
Reducing CO_2 emissions	Reducing CO_2 emissions from ground based transport, contributing to a London-wide 60% reduction by 2025	Slight Positive	Reduced congestion and more resilient crossing would lead to reduced emissions, but tolling strategy would determine overall traffic volumes and therefore the wider congestion effect. Shorter average journey times
Adapting for climate change	Maintaining the reliability of transport networks	Moderate Positive	Additional fixed cross river link would improve resilience on the network
Goal 6: Support delivery of the London 2012 Olympic and Paralympics Games and its legacy			
Developing and implementing a viable and sustainable legacy for the 2012 Games	Supporting regeneration and convergence of social and economic outcomes between the five Olympic boroughs and the rest of London	Moderate Positive	New cross river link in east London which would improve connectivity and is excellent for regeneration, however there would be a toll
	Physical transport legacy	Neutral	No impact
	Behavioural transport legacy	Neutral	No impact
Deliverability and Risks		**Option 14**	
		Gallions Reach local bridge	
Issue	**Assessment Criteria**		
Deliverability and Acceptability Risks	Engineering feasibility risk	Medium	River crossing section would be similar to TGB design
	Complexity of delivery (risk)	Medium	Complex building in the river, however river would remain navigable
	Consent risk	High	Similar to TGB although risk likely to reduce if Silvertown is built
	Funding risk	High	No funding secured
	Stakeholder acceptability risk	High	LB Bexley may still oppose this scheme, but risk likely to reduce if Silvertown is built
	Public acceptability risk	Medium	May be strong opposition groups (similar to TGB)
	Overall deliverability risk	High	Risk reduces with Silvertown
Complexity of operation	Operational feasibility risk	Low	Once operational, no new technology
Value for Money	Benefit Cost Ratio	> 4	Approximately 4.1 to 1
Affordability and Financial Sustainability	CAPEX	£500m <£1bn	£324m, £600m outturn prices
	OPEX per annum	£2m < £5m	New bridge management arrangement
	Revenue implications per annum	£10m < £50m	Cannot assume toll at Blackwall
	Funding potential within TfL budget	Low	No funding
	Funding potential with private finance, e.g. via S106, securitisation of revenue, and DfT	Low	No impact on development, so no possibility to secure funding
Timescales	Timescale for delivering the changes	Long-term	
	Program risk	High	

Option D8 – Assessment against programme objectives

Option D8 – improving the efficiency of the highway network

Peak congestion

6.332. The traffic impacts of this option will be critical to acceptance, given the potential for objections if the scheme would add significantly to traffic volumes on residential roads in the borough. However, it should be noted that what is an 'acceptable' level of traffic on residential roads will be a subjective matter; while it is likely that a scheme can be developed which would be considered satisfactory from a strategic point of view, even very small impacts can have strong effects amongst local communities. Given the previous record of opposition from residents affected by TGB, there would be a risk that no level of traffic growth would be deemed acceptable, and organised opposition could result.

6.333. The scheme would be of a smaller scale than the former TGB scheme, and would offer lower capacity connections. Nevertheless, it is clear that congestion at existing crossings would be significantly reduced with the provision of a new bridge at Gallions Reach.

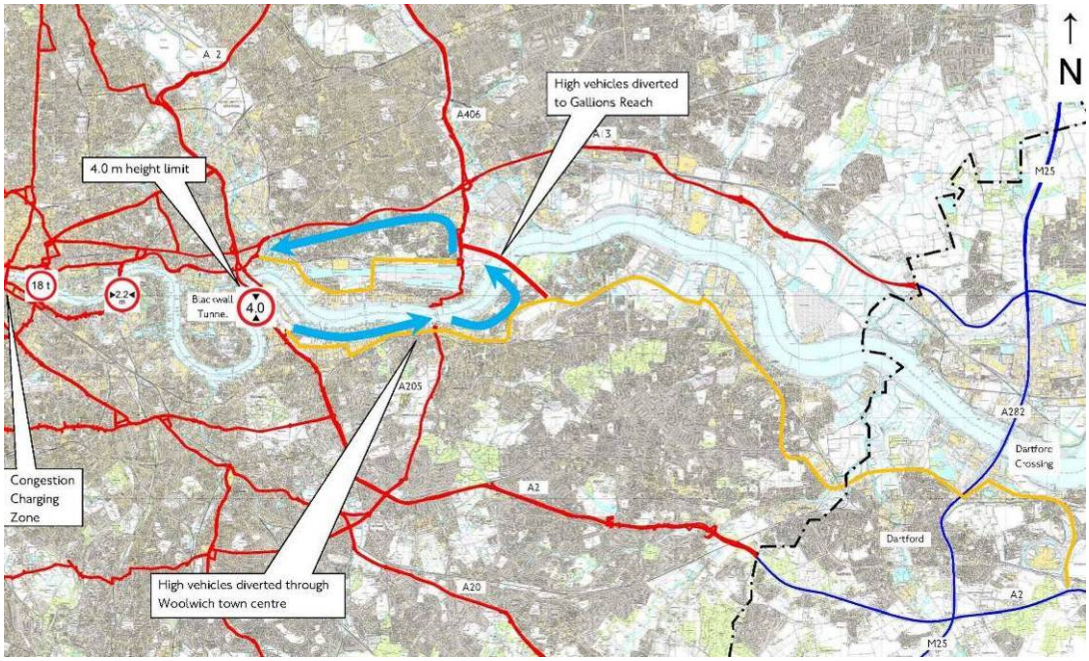
6.334. A toll would be applied to manage traffic volumes; the level of tolls, and any associated discounts etc., will set the overall volume of demand and the wider traffic impacts away from the crossings themselves.

6.335. It is considered likely that a user charging regime could be instituted which managed to deliver local benefits of the new crossing while discouraging through traffic, although a large amount of modelling work would be needed to refine the proposals to establish the optimum levels and therefore the associated traffic impacts. Without this work undertaken to a greater level of detail it is not possible to be definitive as to whether the impacts of a new bridge could be acceptable.

Crossing resilience and network reliability

6.336. A bridge would by its nature be significantly more robust in its operations than either the current Woolwich ferry or a new Gallions Reach ferry. It would be open 24 hours a day, and much less likely to be subject to poor weather and technical failures. It would also provide a diversion route in the event of an incident at another crossing, although its ability to do this will be limited by the capacity of the wider network.

Figure 5.30 – Blackwall resilience – large vehicle route with Gallions



6.337. In terms of providing a diversionary route in the event of incidents at Blackwall, a bridge at Gallions Reach would provide a suitable amount of capacity on the crossing to handle enough of the diverted traffic to make a substantial improvement on the current situation. However, the diversion of traffic from Blackwall to Gallions would be problematic, given the distance between the crossing points, and the bottlenecks which exist between them.

6.338. Vehicles diverted from close to Blackwall would need to follow the A206 corridor through Charlton and Woolwich, which is all dual carriageway, but has only limited capacity given bottlenecks at the Anchor & Hope Lane junction, and traffic would need to pass through Woolwich town centre.

6.339. Traffic arriving from the A2 is also likely to take a shorter route to Gallions Reach, given the potential for a shorter journey than the A206, and the potential for congestion along it.

6.340. However, the South Circular is largely a single carriageway between the A2 and Woolwich, with a notable bottleneck at Shooters Hill. It is also likely that A2 traffic aware of the closure of Blackwall ahead would divert off the A2 early, and seek local roads to access a bridge at Gallions Reach instead. This is likely to be of major concern to LB Bexley, as these routes are low capacity single carriageways, and often residential. This scenario is likely to result in widespread congestion in the area, not dissimilar to the congestion which can occur today when Blackwall closes but with a centre of gravity further to the east than at present.

6.341. It should be noted that these diversionary effects assume the provision of a bridge at Gallions Reach in isolation; they would be reduced or eliminated if the option was pursued together with a tunnel at Silvertown, which would act as the diversionary route for the Blackwall tunnel.

Journey times

6.342. A key advantage of this crossing compared with the vehicle ferry alternative is that although it would cost more to construct, it would provide a very significantly higher capacity, operate 24 hours a day, and is likely to cost less to operate and maintain.

6.343. Importantly, the journey time savings with a bridge would be very substantial, with a potential crossing time of around 3 minutes from the A2016 to Royal Docks Road, compared with around 15 minutes typically for the ferry (assuming no ferry queues).

Option D8 – supporting the public transport network

6.344. The option would allow new orbital bus services to connect the communities on either side of the Thames, with a dedicated priority lane for buses and goods vehicles assumed, protecting buses from any congestion. This could spread public transport benefits over a wide area of Greenwich, Newham, Bexley and Barking & Dagenham.

Option D8 – integrating with land use policies

6.345. A bridge would drastically reduce journey times from Opportunity Areas along the Thames and help increase the viability of these sites for development or more intensive use. This effect would be much stronger than a vehicle ferry.

6.346. It would provide much greater access to the Docklands and central London markets for business in the north Bexley/north Greenwich areas, as well as greatly improved access to the main road network north of the Thames. It would also relieve congestion at the Blackwall tunnel. As such, the regeneration impacts of the scheme are strong, particularly in the Bexley and Greenwich areas of south east London. It would also improve access from parts of east London, such as the Royal Docks, to the M25, Kent and the channel ports, avoiding the Dartford Crossing.

6.347. There is some risk however that congestion on the routes in the south – such as the corridor through Erith – could cause some knock-on negative impacts on these areas; these effects would need to be tested carefully and mitigation considered.

Option D8 – impacts on health, safety and the environment

6.348. A bridge at Gallions would provide a pedestrian and cycle crossing and therefore it will have a positive impact on health.

6.349. A local bridge at Gallions Reach would have impacts on the river due to the construction of piers. There would also be a visual impact. To a certain extent these impacts are offset against the benefits resulting from reduced congestion and improved crossing resilience – although on balance, there will still be a negative effect on the environment.

6.350. By providing a full vehicle gauge crossing, it would reduce the volumes of large vehicles using the Blackwall tunnel, which would improve the safety of the Blackwall tunnel; however being several kilometres downstream the effects are minor compared with closer crossings.

Option D8 – borough and other stakeholder views

6.351. The local boroughs have markedly different views on the option for a bridge. Greenwich and Newham – within which the scheme would lie – are strongly in favour of a bridge.

6.352. The neighbouring borough of Bexley, however, is concerned about the potential for traffic to increase on its residential roads, and is opposed to a bridge in this location.

Option D8 – achieving value for money

6.353. A cost estimate has been undertaken of the smaller scale bridge option; the base cost of the bridge is expected to be around £325 million (current prices, excluding risk). With other additional costs for land, design, site investigation, construction supervision, future inflation and risk this would be likely to rise to around £550 million in outturn prices.

6.354. There is a possibility of implementing a bridge crossing in stages, constructing a single carriageway bridge with a segregated footway / cycleway and a later second single carriageway (without a footway / cycleway). The bridges would share some support structures, which would reduce the cost of the second bridge. This option could be a means of allowing a lower capacity local link to be established early and capacity to be added later once other elements of the package were implemented to prevent the Gallions crossing attracting unwanted through traffic onto local roads, but may not offer best value overall, and comes with operational issues related to slow moving vehicles on the significant incline, and an inability to pass a broken down vehicle. The total cost estimate of this option would be approximately £650 million, £100 million higher than as a single project.

6.355. The large shortening of journey times resulting from a new bridge at this location generates large benefits and a positive business case.

6.356. User charging at the new bridge would almost certainly be needed to provide a source of revenue to contribute towards the costs of construction; it would also help to manage the growth in demand which would otherwise occur with the shortening of journey times under this option.

Option D8 – Programme objective summary

6.357. This option's performance against the programme objectives is set out in the table below.

		D8. Gallions local bridge
To improve the efficiency of the highway network in the London Thames Gateway, especially at river crossings, and provide greater resilience for all transport users	Peak Blackwall congestion	Moderate Positive
	Blackwall crossing resilience	Slight Positive
	Connectivity east of Greenwich	Moderate Positive
	Approach road independence	Slight Positive
	Local road reliability (Greenwich)	Slight Positive
	Local road reliability (Woolwich)	Slight Positive
To support the needs of existing businesses in the area and to encourage new business investment	Local road reliability (Bexley)	Slight Negative
	Local road reliability (Royal Docks)	Moderate Positive
	JTs across sub-region (peak)	Moderate Positive
	JTs across sub-region (off-peak)	Moderate Positive
To support the provision of public transport services in the London Thames Gateway	Reliability of local buses	Moderate Positive
	Allows new orbital public transport	Moderate Positive
	Mode shift potential, car to public	Neutral
To integrate with local and strategic land use policies	Lower Lea Valley OA	Neutral
	Greenwich Peninsula OA	Slight Positive
	Royal Docks OA	Moderate Positive
	London Riverside OA	Moderate Positive
	Bexley Riverside OA	Moderate Positive
	Thamesmead & Abbey Wood OA	Moderate Positive
	Woolwich OA	Moderate Positive
	Charlton Riverside OA	Slight Positive
To minimise the impacts of any proposals on health, safety and the environment	Health	Slight Positive
	Safety	Slight Positive
	Environment	Slight Negative
To ensure where possible that any proposals are acceptable in principle to key stakeholders, including affected boroughs	Local boroughs	Slight Negative
	Other stakeholders	Moderate Positive
To achieve value for money	Business case	Moderate Positive
	Wider economic benefits	Moderate Positive
	Low cost for users	Moderate Negative
	CIL funding potential	Moderate Positive
	Potential for user revenue to offset	Moderate Positive
	Capital cost	Moderate Negative

Assessment of Option D8 (Local Gallions Reach Bridge) – conclusion

6.358. Under Option D8, a local bridge would be built between Beckton and Thamesmead at Gallions Reach, in conjunction with a new road crossing at Silvertown.

6.359. This option has been assessed against the MTS goals and outcomes using SAF and the specific programme objectives.

Goal 1 – support economic development and population growth

6.360. The option performs positively against this goal overall, with the new bridge providing additional capacity and fast link across the Thames within Opportunity Areas.

Goal 2 – quality of life

6.361. The option performs neutrally overall against this goal, with benefits to bridge users of better cross-river links and faster journey times but some potential for traffic impacts on local communities and on the river.

Goal 3 – safety and security

6.362. The option performs slightly positively against this goal, with the new crossing providing a full vehicle gauge route as an alternative to the Blackwall tunnel.

Goal 4 – transport opportunities

6.363. The option performs positively overall against this goal, with the potential for bus services to provide a number of new cross-river journey opportunities.

Goal 5 – climate change

6.364. The option performs positively overall against this goal, with shorter journeys and lower congestion, provided that tolling is used to manage traffic levels.

Goal 6 – support delivery of the London 2012 Olympic and Paralympic Games and its legacy

6.365. The option performs slightly positively overall against this goal, with better connectivity across the Thames in the east sub-region.

Programme objectives

6.366. An initial assessment of the impact of a bridge at Gallions Reach on resilience suggests that there would be congestion and resilience benefits, but less significant benefits than a crossing at Silvertown, which would be adjacent to Blackwall and could therefore more effectively handle excess traffic demand and provide an alternative route. However by filling a major gap in the road network, the overall potential journey time savings from a bridge would be much greater than either a new crossing at Silvertown, or a ferry in the same location.

6.367. Furthermore, while there would be some stakeholder support for a bridge at Gallions Reach (including LB Newham and RB Greenwich), it could be strongly opposed by one stakeholder (LB Bexley) due to the impact of diverted traffic on that borough.

6.368. Therefore **a bridge at Gallions Reach is recommended for further consideration** but this consideration must carefully consider whether impacts in LB Bexley can be mitigated through the application of appropriate traffic management, road user

charging, and/or construction of this in conjunction with another crossing, to ensure that the impacts on the borough's roads can be minimised.

6.369. If LB Bexley remains opposed, there is a high risk of opposition to obtaining consent at the powers stage.

OPTION D9 – LOCAL ROAD TUNNEL AT GALLIONS REACH

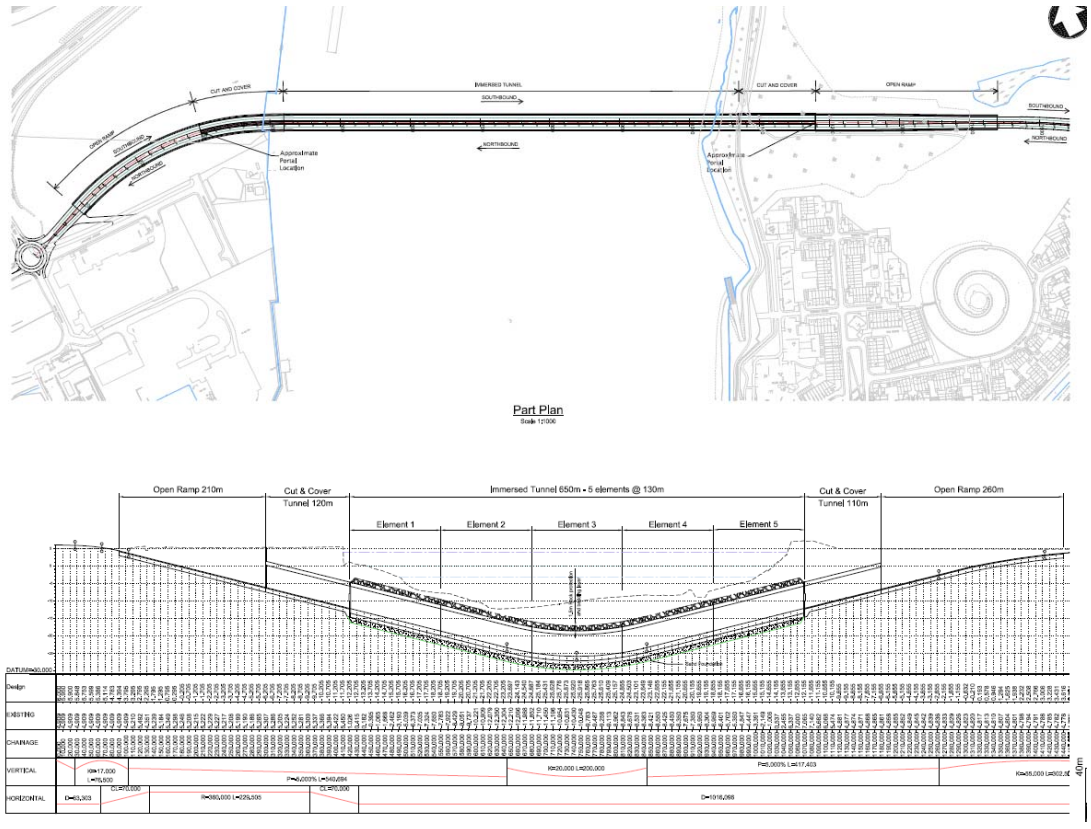
Option D9 – Option description

6.370. The previous option for a local bridge at Gallions Reach assumes that a local bridge would take a similar form to the TGB scheme, at least for the section across the river. However, this is a very large structure, with around 50 metres clearance to the river and a span of around 200 metres; it would be of a similar scale to the Queen Elizabeth II Bridge at Dartford, so would still be a very large intervention.

6.371. An alternative option is to build a local crossing in the form of a tunnel. TfL has considered whether this would be more feasible in the form of an immersed tunnel or a bored tunnel. This work suggests that a bored tunnel would be significantly more expensive than an immersed tunnel in this location, and that an immersed tunnel would be of a similar magnitude of cost to a bridge. An immersed tunnel would have greater impacts on the river (both navigation and ecology), but these are likely to be manageable, and in the tunnel's final state the river would be left as today, unlike the bridge option.

6.372. It is therefore assumed that the tunnel option is in the form of an immersed tunnel. An indicative tunnel alignment is shown below.

Figure 5.31 – Indicative alignment of an immersed tunnel



6.373. As with the bridge option, the tunnel would be very resilient, open 24 hours a day and resilient to poor weather.

6.374. Unlike the bridge, a tunnel could not easily accommodate pedestrians and cyclists; although given the exposure on the bridge alternative at 50 metres above the Thames, it is unclear how effectively a bridge would cater for these users.

Option D9 – Assessment against SAF

6.375. The table below summarises the option against the Strategic Assessment Framework.

MTS Challenges	MTS Outcomes	Qualitative Score	Comments
Goal 1: Support economic development and population growth			
Supporting sustainable population and employment growth	Balancing capacity and demand for travel through increasing public transport capacity	Moderate Positive	Additional river crossing for vehicles, also it enables new cross river bus links with a dedicated busway
	Balancing capacity and demand for travel through reducing the need to travel	Slight Positive	Toll could be used to manage peak demand - details are not yet worked through
Improving transport connectivity	Improving people's access to jobs	Moderate Positive	Additional cross river link would improve access to jobs
	Improving access to commercial markets for freight movements and business travel	Moderate Positive	Additional cross river link, suitable for HGVs, provides a new route for freight movements. Less of a strategic link than TGB
Delivering an efficient and effective transport system for goods and people	Smoothing traffic flow (managing delay, improving journey time reliability and resilience)	Moderate Positive	As an alternative to the existing Woolwich ferry, this scheme would generate huge journey time savings and improve reliability through being useable in almost all weather conditions and not liable to mechanical failure
	Improving public transport reliability	Neutral	Any new bus routes would be reliable due to the dedicated busway, no impact on existing services
	Reducing operating costs	Moderate Positive	Operating costs would be offset by toll revenue
	Bringing and maintaining all assets to a state of good repair	Slight Positive	Replaces Woolwich ferry which is currently difficult to maintain
	Enhancing use of the Thames for people and goods	Strong Positive	Additional river crossing for vehicles, also it enables new cross river bus links
Goal 2: Quality of Life			
Improving journey experience	Improving public transport customer satisfaction	Slight Positive	Potential for improvements to local cross river bus connectivity
	Improving road user satisfaction (drivers, pedestrians, cyclists)	Moderate Positive	Improved journey time and reduced congestion at Blackwall, however, there would be a toll
	Reducing public transport crowding	Neutral	No impact
Enhancing the built and natural environment	Enhancing streetscape, improving the perception of urban realm and developing 'better streets' initiatives	Slight Negative	Pedestrians and cyclists would be forced to use the Woolwich foot tunnel which is less pleasant than the ferry
	Protecting and enhancing the natural environment	Slight Negative	Severe impacts on the river during construction, also construction of new road
Improving air quality	Reducing air pollutant emissions from ground based transport, contributing to EU air quality targets	Slight Positive	Reduced congestion and more resilient crossing would lead to reduced emissions, but tolling strategy would determine overall traffic volumes and therefore the wider congestion effect. Shorter average journey times
Improving noise impacts	Improving perceptions and reducing impacts of noise	Neutral	Additional noise would mostly be in the tunnel, so no overall impact
Improving health impacts	Facilitating an increase in walking and cycling	Neutral	Tunnel would not be open to pedestrians or cyclists, so no overall impact
Goal 3: Safety and security			
Reducing crime, fear of crime and anti-social behaviour	Reducing crime rates (and improving perceptions of personal safety and security)	Neutral	No impact
Improving road safety	Reducing the numbers of road traffic casualties	Slight Positive	Full vehicle gauge crossing with modern safety features, would reduce the number of large vehicles using Blackwall. This would improve safety there and put those vehicles into a safer environment
Improving public transport safety	Reducing casualties on public transport networks	Neutral	No impact

Goal 4: Transport Opportunities			
Improving accessibility	Improving the physical accessibility of the transport system	Slight Positive	Potential for new cross river bus links, which would be fully accessible
	Improving access to services	Slight Positive	Would allow new cross river bus links
Supporting regeneration and tackling deprivation	Supporting wider regeneration	Slight Positive	New bus link would generate more trips, links to London Plan growth areas
Goal 5: Climate change			
Reducing CO_2 emissions	Reducing CO_2 emissions from ground based transport, contributing to a London-wide 60% reduction by 2025	Slight Positive	Reduced congestion and more resilient crossing would lead to reduced emissions, but tolling strategy would determine overall traffic volumes and therefore the wider congestion effect. Shorter average journey times
Adapting for climate change	Maintaining the reliability of transport networks	Moderate Positive	Additional fixed cross river link would improve resilience on the network
Goal 6: Support delivery of the London 2012 Olympic and Paralympics Games and its legacy			
Developing and implementing a viable and sustainable legacy for the 2012 Games	Supporting regeneration and convergence of social and economic outcomes between the five Olympic boroughs and the rest of London	Moderate Positive	New cross river link in east London which would improve connectivity and is excellent for regeneration, however there would be a toll
	Physical transport legacy	Neutral	No impact
	Behavioural transport legacy	Neutral	No impact
Deliverability and Risks		**Option 15**	
		Gallions Reach local tunnel	
Issue	**Assessment Criteria**		
Deliverability and Acceptability Risks	Engineering feasibility risk	Medium	Conventional crossing and there is sufficient space to build
	Complexity of delivery (risk)	High	Complex building in the river, as an immersed tunnel
	Consent risk	High	Similar to TGB although risk likely to reduce if Silvertown is built
	Funding risk	High	No funding secured
	Stakeholder acceptability risk	High	LB Bexley may still oppose this scheme, but risk likely to reduce if Silvertown is built
	Public acceptability risk	Medium	May be strong opposition groups (similar to TGB)
	Overall deliverability risk	High	Risk reduces with Silvertown
Complexity of operation	Operational feasibility risk	Low	Once operational, no new technology
Value for Money	Benefit Cost Ratio	> 4	Approximately 4.1 to 1
Affordability and Financial Sustainability	CAPEX	£500m <£1bn	£309m, £600m outturn prices
	OPEX per annum	£2m < £5m	New tunnel management arrangement
	Revenue implications per annum	£10m < £50m	Cannot assume toll at Blackwall
	Funding potential within TfL budget	Low	No funding
	Funding potential with private finance, e.g. via S106, securitisation of revenue, and DfT	Low	No impact on development, so no possibility to secure funding
Timescales	Timescale for delivering the changes	Long-term	
	Program risk	High	

Option D9 – Assessment against programme objectives

Option D9 – improving the efficiency of the highway network

6.376. In traffic terms (congestion, resilience and journey times), a local road tunnel would perform in the same manner as a local road bridge.

Option D9 – supporting the public transport network

6.377. A tunnel would perform much as a local bridge, with a lane for buses and goods vehicles, and opportunities to link the bus networks in east and south east London.

Option D9 – integrating with land use policies

6.378. A fixed link would drastically reduce journey times from Opportunity Areas along the Thames and help increase the viability of these sites for development or more intensive use. This effect would be much stronger than a vehicle ferry.

6.379. Although a bridge would not have the landmark potential of a bridge structure, it would have a lower noise and visual impact on the communities through which it would pass, especially in Thamesmead.

Option D9 – impacts on health, safety and the environment

6.380. An immersed tunnel would have greater environmental effects, including a deep excavation across the whole width of the river. This would require careful management to protect navigation and the marine environment but nevertheless would have at least a short-term impact on the river.

Option D9 – borough and other stakeholder views

6.381. The local boroughs' positions on a bridge are largely driven by the benefits to traffic, or the adverse impacts of that traffic; as such it is likely that the same views would hold as per the bridge option.

6.382. The Port of London Authority will have to be fully engaged to ensure that any impacts on navigation and the river environment during construction are managed to the PLA's satisfaction.

Option D9 – achieving value for money

6.383. The base cost of the immersed tunnel is expected to be around £300 million (current prices, excluding risk). With other additional costs for land, design, site investigation, construction supervision, future inflation and risk this would be likely to rise to around £500 million in outturn prices.

6.384. However it should be noted that less is known about the ground conditions in terms of tunnel construction than is known about a bridge, given the works previously undertaken for TGB, so in reality the costs should be considered to be roughly the same.

6.385. The large shortening of journey times resulting from a new tunnel at this location generates large benefits and a positive business case.

6.386. User charging at the new tunnel would almost certainly be needed to provide a source of revenue to contribute towards the costs of construction; it would also help to manage the growth in demand which would otherwise occur with the shortening of journey times under this option.

Option D9 – Programme objective summary

6.387. This option's performance against the programme objectives is set out in the table below.

		D9. Gallions tunnel
To improve the efficiency of the highway network in the London Thames Gateway, especially at river crossings, and provide greater resilience for all transport users	Peak Blackwall congestion	Moderate Positive
	Blackwall crossing resilience	Slight Positive
	Connectivity east of Greenwich	Moderate Positive
	Approach road independence	Slight Positive
	Local road reliability (Greenwich)	Slight Positive
	Local road reliability (Woolwich)	Slight Positive
To support the needs of existing businesses in the area and to encourage new business investment	Local road reliability (Bexley)	Slight Negative
	Local road reliability (Royal Docks)	Moderate Positive
	JTs across sub-region (peak)	Moderate Positive
	JTs across sub-region (off-peak)	Moderate Positive
To support the provision of public transport services in the London Thames Gateway	Reliability of local buses	Moderate Positive
	Allows new orbital public transport	Moderate Positive
	Mode shift potential, car to public	Neutral
To integrate with local and strategic land use policies	Lower Lea Valley OA	Neutral
	Greenwich Peninsula OA	Slight Positive
	Royal Docks OA	Moderate Positive
	London Riverside OA	Moderate Positive
	Bexley Riverside OA	Moderate Positive
	Thamesmead & Abbey Wood OA	Moderate Positive
	Woolwich OA	Moderate Positive
	Charlton Riverside OA	Slight Positive
To minimise the impacts of any proposals on health, safety and the environment	Health	Neutral
	Safety	Slight Positive
	Environment	Slight Negative
To ensure where possible that any proposals are acceptable in principle to key stakeholders, including affected boroughs	Local boroughs	Slight Negative
	Other stakeholders	Moderate Positive
To achieve value for money	Business case	Moderate Positive
	Wider economic benefits	Moderate Positive
	Low cost for users	Moderate Negative
	CIL funding potential	Moderate Positive
	Potential for user revenue to offset	Moderate Positive
	Capital cost	Moderate Negative

Assessment of Option D9 (Local Gallions Reach tunnel) – conclusion

6.388. Under Option D9, a local road tunnel would be built between Beckton and Thamesmead at Gallions Reach, in conjunction with a new road crossing at Silvertown.

6.389. This option has been assessed against the MTS goals and outcomes using SAF and the specific programme objectives.

Goal 1 – support economic development and population growth

6.390. The option performs positively against this goal overall, with the new bridge providing additional capacity and fast link across the Thames within Opportunity Areas.

Goal 2 – quality of life

6.391. The option performs neutrally overall against this goal, with benefits to tunnel users of better cross-river links and faster journey times but some potential for traffic impacts on local communities and on the river during construction.

Goal 3 – safety and security

6.392. The option performs slightly positively against this goal, with the new crossing providing a full vehicle gauge route as an alternative to the Blackwall tunnel.

Goal 4 – transport opportunities

6.393. The option performs positively overall against this goal, with the potential for bus services to provide a number of new cross-river journey opportunities.

Goal 5 – climate change

6.394. The option performs positively overall against this goal, with shorter journeys and lower congestion, provided that tolling is used to manage traffic levels.

Goal 6 – support delivery of the London 2012 Olympic and Paralympic Games and its legacy

6.395. The option performs slightly positively overall against this goal, with better connectivity across the Thames in the east sub-region.

Programme objectives

6.396. The traffic impacts of a tunnel are the same as a bridge, both positive (e.g. capacity and journey time) and negative (potential wider effects). The environmental impact of construction would be greater than other options, but in its final state it would have less intrusion on the river and the local environment than a bridge.

6.397. Therefore **a tunnel at Gallions Reach is recommended for further consideration** but this consideration must carefully consider whether impacts in LB Bexley can be mitigated through the application of appropriate traffic management, road user charging, and/or construction of this in conjunction with another crossing, to ensure that the impacts on the borough's roads can be minimised.

6.398. If LB Bexley remains opposed, there is a high risk of opposition to obtaining consent at the powers stage.

7. ASSESSMENT OF SHORTLISTED OPTIONS / PACKAGES

7.1. The previous sections of this report identify schemes which appear to be feasible and which demonstrate the potential to meet the programme's objectives. This section considers these schemes against the programme objectives in more detail, including consideration of the potential for a package of complementary projects to meet the objectives as well as stand alone / independent projects.

Scheme options shortlisted

7.2. Following the initial long list assessment outlined in the previous chapters, the following schemes have been shortlisted for further assessment:

- user charging at the Blackwall tunnel (in conjunction with new infrastructure);
- a bored tunnel at Silvertown;
- a new vehicle ferry at Gallions Reach;
- a new vehicle ferry at Woolwich; and
- a new local road bridge or tunnel at Gallions Reach (in conjunction with Silvertown).

7.3. Note that while the final two options (bridge or tunnel at Gallions Reach) are distinct options, they have been treated here as one option because they have similar costs, benefits and effects. If the option proves to be worth pursuing further beyond the next stage, more detailed work would be needed to examine the costs and impacts in more detail to choose a preferred solution.

Potential to meet all investment criteria

7.4. The river crossings programme is seeking to address problems across a long section of the Thames in east/south east London; the highway problems are summarised as:

- the imbalance between highway network capacity and demand around the Blackwall Tunnel, which results in significant congestion;
- the unreliability of the Blackwall Tunnel, and the limited ability of the surrounding road network to cope with incidents when they occur; and
- the possibility that the Woolwich Ferry may be withdrawn from service due to the condition of the asset, which would significantly reduce connectivity in the area. In assessing options for addressing this issue, consideration should be given to means of reducing current and future impacts of crossings on the road network.

7.5. Any river crossing schemes or policies should be aimed at addressing these problems to ensure that the principal needs are addressed; these are the investment criteria.

7.6. The options shortlisted above all meet some of the criteria, but none meet all of them in isolation. It is therefore clear that a package of measures will be required to meet the investment criteria; for example, a combination of new infrastructure as well as user charging to manage the effects of generated traffic.

7.7. The next phase of work will test each of the shortlisted options in more detail, to assess the costs, benefits and impacts of the options in isolation. The options will then be tested in combination, to produce packages which address all the investment criteria, and to understand any interactions between the options. An integral part of the process will involve public consultation.

7.8. The next section describes the general process which will be undertaken and gives an indication of possible packages to address the challenges. However it should be noted that the next phase of work will inform the final shortlisted packages, and the benefits and costs of these packages will be used, together with financial modelling and the results of public consultation, to inform a final shortlisting of options for progression. Therefore this assessment of options may be subject to revision at a later date, in light of the findings of this work.

Assembly into indicative packages

7.9. The shortlisted options have been assessed at a high level as to their ability to address the three investment criteria, and then grouped into potential packages of measures with the potential to address all the criteria.

7.10. In addition, consideration needs to be given to a Do Nothing or Do Minimum option.

7.11. The indicative package assessment is given in the following pages, although it should again be noted that this is an indication of the potential for the shortlisted options to be packaged together, and more detailed work will be necessary to finalise the packages for detailed assessment, including public consultation.

Indicative scheme packages

Highway scheme option	Recommend for further work?	Investment criteria addressed: Congestion	Network resilience	Downriver connect-ivity	£ million, approx Scheme cost, current excl risk	Scheme cost, outturn incl risk	Selected for package
Do Nothing	✗						
Blackwall user charge	✓	🟢	🔴	🔴	0*	0*	B, C, D
DLR extension (for modal shift)	✗						
New vehicle ferry, Silvertown	✗						
New vehicle ferry, Woolwich	✓	🔴	🔴	🟢	60	120	A, C
New vehicle ferry, Gallions Reach	✓	🔴	🔴	🟢	80	150	B
Third Blackwall bore	✗						
Silvertown lifting bridge	✗						
Silvertown bored tunnel	✓	🟢	🟢	🔴	350	600	B, C, D
Silvertown immersed tunnel	✗						
Woolwich bridge	✗						
Woolwich tunnel	✗						
Thames Gateway Bridge	✗						
Local Gallions bridge	✓	🟡	🟡	🟢	325	550	D, E
Local Gallions tunnel	✓	Very similar costs and benefits as the bridge; local link taken forward could be either bridge or tunnel at this stage so tunnel not listed as a separate package element.					

Package A (Do Minimum):						
New vehicle ferry, Woolwich	🔴	🔴	🟢	60	120	
Package A effect:	🔴	🔴	🟢	60	120	
Package B:						
Blackwall user charging	🟢	🔴	🔴	0*	0*	
Silvertown bored tunnel	🟢	🟢	🔴	350	600	
New vehicle ferry, Gallions Reach	🔴	🔴	🟢	80	150	
Package B effect:	🟢	🟢	🟢	430	750	
Package C:						
Blackwall user charging	🟢	🔴	🔴	0*	0*	
Silvertown bored tunnel	🟢	🟢	🔴	350	600	
New vehicle ferry, Woolwich	🔴	🔴	🟢	60	120	
Package C effect:	🟢	🟢	🟢	410	720	
Package D:						
Blackwall user charging	🟢	🔴	🔴	0*	0*	
Silvertown bored tunnel	🟢	🟢	🔴	350	600	
Local Gallions bridge or tunnel	🟡	🟡	🟢	325	550	
Package D effect:	🟢	🟢	🟢	675	1150	
Package E:						
Blackwall user charging	🟢	🔴	🔴	0*	0*	
Local Gallions bridge or tunnel	🟡	🟡	🟢	325	550	
Package E effect:	🟢	🟡	🟢	325	550	

Key:
- 🟢 Good
- 🟡 Fair
- 🔴 Poor

** A Blackwall congestion charge would have an implementation cost, but this would be recovered from user revenue and deliver a positive financial effect.*

7.12. The potential packages identified are described below.

Package A (Do Minimum)

- New vehicle ferry at Woolwich

7.13. Package A represents the Do Minimum scenario. Under the Do Nothing scenario – with no investment in any of the crossings – TfL would have to close the ferry service at the end of its operational life, and this is likely to occur by 2024 at the latest. However, TfL is under a legal obligation to provide the service, and therefore failing to plan for its replacement with a new facility could leave TfL in breach of its legal obligations, and would be highly likely to be challenged.

7.14. The Do Minimum scenario will therefore test the scenario of replacing the existing Woolwich ferry with a new ferry service at Woolwich to allow TfL's obligations to continue to be met.

Package A strengths

Simplicity – minimal consent risk

Lowest cost

Package A weaknesses

No new capacity

No new resilience

Continued problems in Woolwich / North Woolwich associated with queues

Potential inability to retain safeguarding for future crossings

Package A opportunities

Release of safeguarded land for development

Package A threats

Potential major impact on local economy of continued poor river crossings

Package B

- User charging at Blackwall
- Silvertown bored tunnel
- New vehicle ferry at Gallions Reach

7.15. The combination of the Silvertown tunnel and user charging at this and Blackwall will provide the necessary new capacity and resilience in the Blackwall area, while providing a means to manage traffic growth to lock-in the benefits (i.e. to prevent unrestrained traffic growth eroding the benefits and increasing congestion overall). The user charging also provides a feasible means of raising revenue to fund construction.

7.16. The new vehicle ferry would replace the current Woolwich ferry and therefore maintain connectivity between Blackwall and Dartford.

Package B strengths

Low cost option to fully address all the investment criteria

Potential to move forward with new ferry in the short term, reducing risk of critical failure leading to loss of Woolwich ferry prior to replacement

Most closely aligns with the Mayor's policies

Package B weaknesses

Lukewarm support for ferry from some local boroughs who prefer a bridge or tunnel

Potential short lifespan of ferry infrastructure if a bridge or tunnel at Gallions Reach is desired in medium term

Package B opportunities

While some support is lukewarm, no local boroughs actively oppose the package (which was not the case with TGB)

Package B threats

Ferry is not the preferred option of some key stakeholders; risk of proposals not being supported by a future Mayor

Package C

- User charging at Blackwall
- Silvertown bored tunnel
- New vehicle ferry at Woolwich

7.17. The combination of the Silvertown tunnel and user charging at this and Blackwall will provide the necessary new capacity and resilience in the Blackwall area, while providing a means to manage traffic growth to lock-in the benefits (i.e. to prevent unrestrained traffic growth eroding the benefits and increasing congestion overall). The user charging also provides a feasible means of raising revenue to fund construction.

7.18. The new vehicle ferry would replace the current Woolwich ferry and therefore maintain connectivity between Blackwall and Dartford.

Package C strengths

Lowest cost option to fully address all the investment criteria

Potential to move forward with new ferry in the short term, reducing risk of critical failure leading to loss of Woolwich ferry prior to replacement

Closely aligns with the Mayor's policies

Package C weaknesses

Disruption to local traffic on approach roads if/when queues extend beyond queuing capacity

Lukewarm support for ferry from some local boroughs

Potential short lifespan of ferry infrastructure if a bridge or tunnel at Gallions Reach is desired in medium term

Package C opportunities

While some support is lukewarm, no local boroughs actively oppose the package (which was not the case with TGB)

Package C threats

Ferry is not the preferred option of some key stakeholders; risk of proposals not being supported by a future Mayor

May entail a prolonged closure of the ferry service during construction

Package D

- User charging at Blackwall
- Silvertown bored tunnel
- New local bridge or tunnel at Gallions Reach

7.19. This package addresses all three of the highway challenges, but is a higher cost option than packages B and C. The key difference with Packages B and C is the replacement of a vehicle ferry with a local fixed link at Gallions Reach. This would be a more local crossing than the previous TGB scheme, as the Silvertown tunnel would provide relief to Blackwall and cater for A2 traffic, and therefore the effects within Bexley would be reduced. However, given LB Bexley's objections to a fixed link, this package carries a high level of risk of objections from that borough. Conversely, it would be supported by most of the other local boroughs, which prefer a fixed link solution, as this would provide greater journey time savings, higher potential to accommodate growth, and greater availability (e.g. open 24 hours a day and less affected by poor weather).

Package D strengths

Effectively addresses all the investment criteria

Strong support from the local boroughs Greenwich and Newham (but not nearby Bexley)

Package D weaknesses

Likely opposition from LB Bexley (although inclusion of Silvertown in the package and lower capacity may address main traffic issues)

Higher cost than Packages B and C

Package D opportunities

Potential for optimum traffic management solution with three fixed links charged and managed together

Potential for additional connections to the crossings to be made in the longer term if desirable

Package D threats

The Mayor has opposed the construction of TGB; the inclusion of Silvertown in the package and lower capacity changes the nature of the crossing at Gallions Reach and may make this option sufficiently different to be acceptable. Nevertheless, there is a risk that this option may be deemed to be contrary to the Mayor's manifesto.

Package E

- User charging at Blackwall
- New local bridge or tunnel at Gallions Reach

7.20. This package seeks to address all three of the highway challenges with only a single piece of new infrastructure, a fixed link at Gallions Reach. This package addresses the connectivity investment criterion better than the Blackwall criteria, but nevertheless it does aid both congestion and resilience at Blackwall, particularly with a user charging regime at Blackwall to manage demand at Blackwall, particularly in the peak periods.

7.21. This option is different from the TGB scheme because it has fewer strategic highway connections and Blackwall charging would reduce demand to cross the Thames. Nevertheless, there is a high risk of objection from LB Bexley.

Package E strengths

Cheapest option including a new fixed link

Aids all the investment criteria, although less effectively than some packages

Strong support from the most pertinent local boroughs Greenwich and Newham (but not nearby Bexley)

Package E weaknesses

Strong opposition from LB Bexley

Resilience during Blackwall incidents poorer than options including Silvertown, given the distance and lack of capacity on routes from Blackwall to Gallions Reach

Package E opportunities

Financially good, with user charging from both Blackwall and Gallions Reach to pay towards a single new crossing

Potential for additional connections to the crossing to be made in the longer term if desirable

Package E threats

The Mayor has opposed the construction of TGB; there is a risk that this package may be deemed to be too similar to TGB and therefore contrary to the Mayor's manifesto.

8. CONCLUSIONS AND RECOMMENDATIONS

8.1. The river crossings programme is seeking to address problems across a long section of the Thames in east/south east London; the highway problems are summarised as:

- the imbalance between highway network capacity and demand around the Blackwall Tunnel, which results in significant congestion;
- the unreliability of the Blackwall Tunnel, and the limited ability of the surrounding road network to cope with incidents when they occur; and
- the possibility that the Woolwich Ferry may be withdrawn from service due to the condition of the asset, which would significantly reduce connectivity in the area. In assessing options for addressing this issue, consideration should be given to means of reducing current and future impacts of crossings on the road network.

8.2. Any river crossing schemes or policies should be aimed at addressing these problems to ensure that the principal needs are addressed; these are the investment criteria.

Conclusions

8.3. Following the initial long list assessment outlined in the previous chapters, the following schemes have been shortlisted for further assessment:

- user charging at the Blackwall tunnel (in conjunction with new infrastructure);
- a bored tunnel at Silvertown;
- a new vehicle ferry at Gallions Reach;
- a new vehicle ferry at Woolwich; and
- a new local road bridge or tunnel at Gallions Reach (in conjunction with Silvertown).

8.4. The options shortlisted above all meet some of the criteria, but none meet all of them in isolation. It is therefore clear that a package of measures will be required to meet the investment criteria; for example, a combination of new infrastructure as well as user charging to manage the effects of generated traffic.

8.5. The package of measures which most closely meets the Mayor's policies and meets all the investment criteria is Package B in the previous section, comprising:

(i) Silvertown tunnel

(ii) Gallions Reach ferry

(iii) User charging at the Blackwall tunnel (only with the new infrastructure)

8.6. This option is therefore the preferred package at this stage, however the next phase of work will test each of the shortlisted options in more detail, to assess the costs,

benefits and impacts of the options in isolation. The options will then be tested in combination, to produce packages which address all the investment criteria. In addition, the proposed options will be subject to public consultation.

8.7. This next phase of work will inform the final shortlisted packages, and the benefits and costs of these packages will be used, together with financial modelling and the results of public consultation, to inform any decisions on options for progression.

8.8. It should be noted therefore that this assessment of options may be revised at a later date in light of the outcome of the next phase of work.

Recommendations

8.9. It is recommended that the shortlisted options be assessed in more detail, to better understand the costs, benefits and impacts, and to ascertain the views of the public and stakeholders. This includes undertaking a comprehensive consultation exercise with both stakeholders and the wider public, and more detailed traffic modelling work.

8.10. The options will then be assembled into packages to be assessed in more detail, including testing the interactions between options, for example, the interaction of multiple crossings, or the impact of different user charging scenarios on the effectiveness of infrastructure options.

8.11. The results of the work should be presented in an Outline Business Case document, comparing the costs, benefits and impacts of the scheme, together with the financial assessments and results of public consultation, to allow an informed decision on the options to be taken forward.