SILVERTOWN TUNNEL

SUPPORTING TECHNICAL DOCUMENTATION

PRELIMINARY OUTLINE BUSINESS CASE

October 2015

This report sets out the outline business case for the Scheme. It assesses its strategic need and compliance with public policy; its value for money, whether it is commercially viable and can be financed, and whether TfL has the capacity and ability to deliver the Scheme.

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This report forms part of a suite of documents that support the statutory public consultation for Silvertown Tunnel in October – November 2015. This document should be read in conjunction with other documents in the suite that provide evidential inputs and/or rely on outputs or findings.

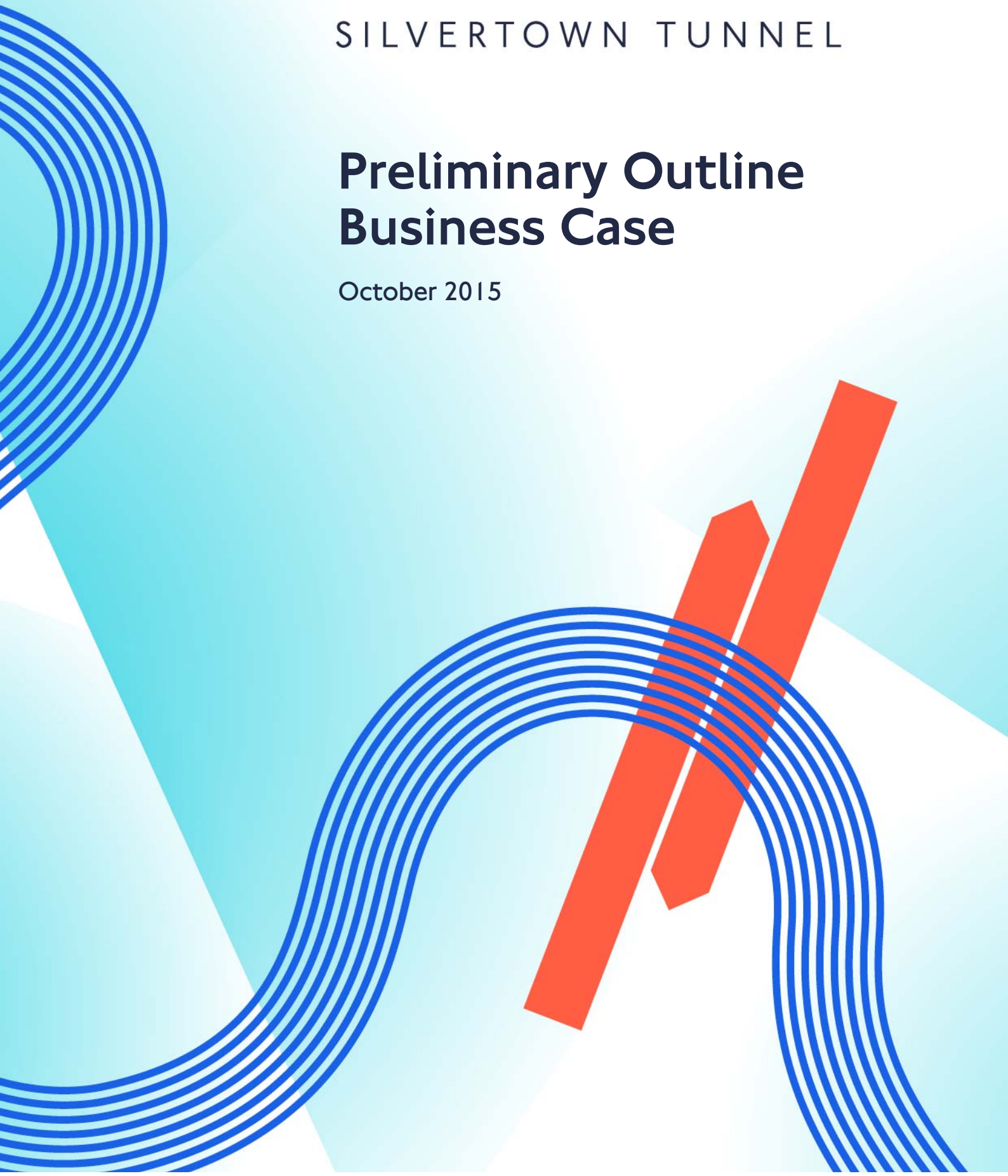
The suite of documents with brief descriptions is listed below:-

- **Preliminary Case for the Scheme**
    - Preliminary Monitoring and Mitigation Strategy
- **Preliminary Charging Report**
- **Preliminary Transport Assessment**
- **Preliminary Design and Access Statement**
- **Preliminary Engineering Report**
- **Preliminary Maps, Plans and Drawings**
- **Preliminary Environmental Information Report (PEIR)**
    - Preliminary Non Technical Summary
    - Preliminary Code of Construction Practice
    - Preliminary Site Waste Management Plan
    - Preliminary Energy Statement
- **Preliminary Sustainability Statement**
- **Preliminary Equality Impact Assessment**
- **Preliminary Health Impact Assessment**
- **Preliminary Outline Business Case**
    - Preliminary Distributional Impacts Appraisal
    - Preliminary Social Impacts Appraisal
    - Preliminary Economic Assessment Report
    - Preliminary Regeneration and Development Impact Assessment

SILVERTOWN TUNNEL

Preliminary Outline Business Case

October 2015



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Silvertown Tunnel

Preliminary Outline Business Case

Planning Act 2008

Infrastructure Planning

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

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List of Abbreviations

Abbreviation	Full Name
A	
AADT	Average Annual Daily Traffic
AAWT	Average Annual Weekly Traffic
AMCB	Analysis of Monetised Costs and Benefits
ANPR	Automatic Number Plate Recognition
ATC	Automated Traffic Counts
B	
BAME	Black, Asian and Minority Ethnic
BCR	Benefit to Cost Ratio
C	
CAZ	Central Activities Zone
CBA	Cost Benefit Analysis
CC	Congestion Charging
CCTV	Closed Circuit Television
COBA-LT	Cost and Benefit to Accidents - Light Touch
CTMP	Construction Traffic Management Plan
D	
DBFM	Design Build Finance and Maintain
DCO	Development Consent Order
DfT	Department for Transport
DI	Distributional Impacts
DLR	Docklands Light Railway
DMRB	Design Manual for Roads and Bridges
E	
EAL	Emirates Air Line
EAR	Economic Assessment Report
EIA	Environmental Impact Assessment
ELHAM	east London Highway Assignment Model
EqIA	Equality Impact Assessment
EWT	Excess Wait Time
F	
FALP	Further Alterations to the London Plan
G	
GC	Generalised Costs

GDP	Gross Domestic Product
GDPW	Gross Domestic Product per Worker
GHG	Greenhouse Gases
GJT	Generalised Journey Time
GLA	Greater London Authority
GVA	Gross Value Added
H	
HGV	Heavy Goods Vehicle
HIA	Health Impact Assessment
I	
IHS	Integrated Household Survey
IoD	Index of Deprivation
IoMD	Index of Multiple Deprivation
IWT	In Work Time
K	
L	
LAD	Local Authority District
LB	London Borough
LCAP	London Congestion Analysis Project
LDF	Local Development Framework
LEZ	Low Emission Zone
LGV	Light Goods Vehicle
LIP	Local Implementation Plan
LMVR	Local Model Validation Report
LOPR	London Office Policy Review
LoRDM	London Regional Demand Model
LP	London Plan
LSOA	Lower Super Output Area
LTDS	London Travel Demand Survey
LTS	London Transportation Studies
M	
MCC	Manual Classified Counts
MEDS	Mayor's Economic Development Strategy
MTS	Mayor's Transport Strategy
N	
NMU	Non-Motorised Users
NN NPS	National Networks National Policy Statement

NPPF	National Planning Policy Framework
NPPG	National Planning Practice Guidance
NPV	Net Present Value
NSIP	Nationally Significant Infrastructure Project
NTEM	National Trip End Model
O	
OBC	Outline Business Case
ONS	Office for National Statistics
OWT	Out of Work Time
P	
PA	Public Accounts
PCU	Passenger Car Unit
PHV	Private Hire Vehicle
PINS	Planning Inspectorate
PLA	Port of London Authority
PPG	Planning Policy Guidance
PPS	Planning Policy Statement
PTAL	Public Transport Access Level
PT	Public Transport
PV	Present Value
PVB	Present Value of Benefits
PVC	Present Value of Costs
Q	
QUADRO	Queues and Delays at Road Works
R	
RA	Regeneration Area
RB	Royal Borough
RODS	Rolling Origin and Destination Survey
RR	Regeneration Report
RRT	Roads Response Team
RSI	Road Side Interview
RSM	Road Space Management
RTF	Road Task Force
RTI	Road Traffic Incident
RXHAM	River Crossings Highway Assignment Model
S	
SACTRA	Standing Advisory Committee on Trunk Road Assessment
SATURN	Simulation and Assignment of Traffic to Urban Road Networks

SHLAA	Strategic Housing Land Availability Assessment
SoS	Secretary of State
SPD	Supplementary Planning Document
SPG	Supplementary Planning Guidance
SRTP	Sub-Regional Transport Policy
T	
TA	Transport Assessment
TAG	Transport Analysis Guidance
TEE	Transport Economic Efficiency
TfL	Transport for London
TLRN	Transport for London Road Network
TRL	Transport Research Laboratory
TUBA	Transport User Benefit Appraisal
V	
VfM	Value for Money
VOC	Vehicle Operating Cost
VCR	Volume/Capacity Ratios
W	
WI	Wider Impacts
WITA	Wider Impacts in Transport Appraisal

Glossary of Terms

Term	Explanation
Assessed Case	The basis on which all assessment and modelling has been carried out
Blackwall Tunnel	A road tunnel underneath the River Thames in east London, linking the London Borough of Tower Hamlets with the Royal Borough of Greenwich, comprising two bores each with two lanes of traffic. The tunnel was originally opened as a single bore in 1897, as a major transport project to improve commerce and trade in London's east end. By the 1930s, capacity was becoming inadequate, and consequently, a second bore opened in 1967, handling southbound traffic while the earlier 19th century tunnel handled northbound.
Control Centre	Facility to deal with issues with over-height, illegal and unsafe vehicles going through Blackwall and Silvertown tunnels, and help manage traffic
Design, Build, Finance and Maintain (DBFM)	A DBFM company is typically a consortium of private sector companies, formed for the specific purpose of providing the services under the DBFM contract. This is also technically known as a Special Purpose Vehicle (SPV). The DBFM Company would obtain funding to design and build the new facilities and then undertake routine maintenance and capital replacement during the contract period, which is typically 25 to 30 years. The DBFO Company would repay funders from payments received from TfL during the lifespan of the contract. Receipt of payments from TfL would depend on the ability of the DBFO Company to deliver the services in accordance with the output specified in the contract and would be subject to deductions if performance is not satisfactory.
Department for Transport (DfT)	The government department responsible for the English transport network and a limited number of transport matters in Scotland, Wales and Northern Ireland that have not been

	devolved.
Development Consent Order (DCO)	This is a statutory order which provides consent for the project and means that a range of other consents, such as planning permission and listed building consent, would not be required. A DCO can also include provisions authorising the compulsory acquisition of land or of interests in or rights over land which is the subject of an application. http://infrastructure.planninginspectorate.gov.uk/help/glossary-of-terms/
Docklands Light Railway (DLR)	An automated light metro system serving the Docklands and east London area. The DLR is operated under concession awarded by Transport for London to KeolisAmey Docklands, a joint venture between transport operator Keolis and infrastructure specialists Amey plc
Emirates Air Line (EAL)	A cable car service across the River Thames in east London, linking the Greenwich peninsula to the Royal Victoria Dock. The service is managed by TfL, and is part of the TfL transport network
Heavy Goods Vehicle (HGV)	European Union term for any vehicle with a gross combination mass of over 3500kg
Induced Demand	The phenomenon that after supply increases, more of a good is consumed. In relation to transport schemes, this means that demand for the network would increase if extra capacity is added
Priority Lane	A dedicated highway lane that has restricted occupancy, available for use by buses, Heavy Goods Vehicles and taxis.
Reference case	An assumed ‘future baseline’ scenario, which represents the circumstances and conditions that we would anticipate in the future year without the implementation of the scheme, taking account of trends (for example in population and employment growth) and relevant developments (such as other committed transport schemes). The reference case is frequently used as a comparator for the ‘with scheme’ case, to show the effect of the scheme against the appropriate reference point.
Reference Design	Design proposals that the consultation and DCO application

	would refer to.
The Scheme	The construction of a new bored tunnel under the River Thames between the Greenwich peninsula and Silvertown, as well as necessary alterations to the connecting road network and the introduction of user charging at both Silvertown and Blackwall tunnels
Toucan Crossing	A signal controlled crossing that allows pedestrians and cyclists to cross a road safety.
Transport for London (TfL)	A local government body responsible for most aspects of the transport system in Greater London. Its role is to implement transport strategy and to manage transport services across London. These services include: buses, the Underground network, Docklands Light Railway, Overground and Trams. TfL also runs Santander Cycles, London River Services, Victoria Coach Station and the Emirates Air Line. As well as controlling a 580km network of main roads and the city's 6,000 traffic lights, TfL regulates London's private hire vehicles and the Congestion Charge scheme.
The Tunnel, Silvertown Tunnel	A new bored tunnel under the River Thames between the Greenwich peninsula and Silvertown
Woolwich Ferry	The Woolwich Ferry links Woolwich (Royal Borough of Greenwich) and North Woolwich (London Borough of Newham). It also links two ends of the inner London orbital road routes; the North Circular and South Circular. It runs every 5-10 minutes throughout the day, from Monday to Friday and every 15 minutes on Saturdays and Sundays. It carries pedestrians, cyclists, cars, vans and lorries. The ferry is operated by Briggs Marine and Environmental on behalf of TfL.

SUMMARY

Purpose of this report

1. Transport for London (TfL) is proposing to construct a new tunnel under the River Thames between the Greenwich Peninsula and Silvertown ('the Silvertown Tunnel', 'the Scheme'). This report is the Outline Business Case for the Scheme, providing information to support the investment decision for the project.

2. The business case is presented in accordance with the Department for Transport's (DfT's) Business Case Guidance.[1] This stipulates a five case model to developing a transport business case which considers whether the scheme:

   - is supported by a robust case for change that fits with wider public policy objectives – the 'strategic case';
   - demonstrates value for money – the 'economic case';
   - is commercially viable – the 'commercial case';
   - is financially affordable – the 'financial case'; and
   - is achievable- the 'management case'.

The Proposed Scheme

3. The Scheme involves the construction of a twin bore road tunnel providing a new connection between the A102 Blackwall Tunnel Approach on Greenwich Peninsula (Royal Borough of Greenwich) and the Tidal Basin roundabout junction on the A1020 Lower Lea Crossing/Silvertown Way (London Borough of Newham). The Silvertown Tunnel would be approximately 1.4km long and be able to accommodate large vehicles including double-deck buses. The Boord Street footbridge over the A102 would be replaced with a pedestrian and cycle bridge.

4. New portal buildings would be located close to each portal to house the plant and equipment necessary to operate the tunnel, including ventilation equipment.

5. The introduction of free-flow user charging on both the Blackwall and Silvertown Tunnels would play a fundamental part in managing traffic demand and support the financing of the construction and operation of the Silvertown Tunnel. The design of the tunnel would include a dedicated bus/coach and

[1] The Transport Business Cases, DfT, January 2013 and associated guidance.

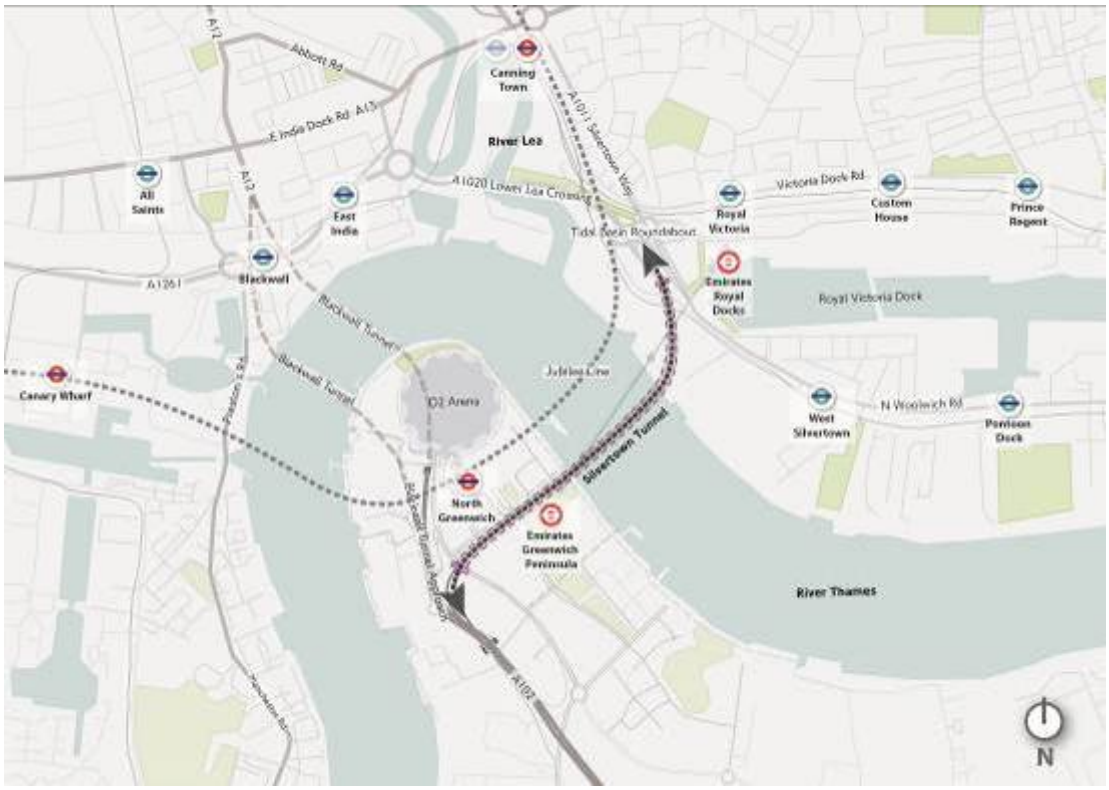
Heavy Goods Vehicles (HGV) lane, which would provide opportunities for TfL to provide additional cross-river bus routes.

6. Main construction works would likely commence in 2018 and would last approximately four years with the new tunnel opening in 2022/23.

Silvertown Tunnel location

7. The new tunnel is proposed to be located in east London adjacent to the existing Blackwall Tunnel – see figure below.

Figure 0 Silvertown Tunnel location



The Strategic Case

8. A new road crossing at Silvertown has extensive national, London-wide and local policy support. In particular it is a project identified in the London Plan and the Mayor's Transport Strategy (MTS), and has been designated a Nationally Significant Infrastructure Project (NSIP) by the Secretary of State for Transport under section 35 of the Planning Act 2008. This requires applications to be decided in accordance with the relevant National Policy Statement, which for road schemes is the National Networks National Policy Statement (NNNPS).

9. In the 'Summary of Need' at the start of section 2 the NNNPS sets out what road and rail NSIP schemes such as Silvertown Tunnel need to deliver: '*The Government will deliver national networks that meet the country's long term*

needs; supporting a prosperous and competitive economy and improving overall quality of life, as part of a wider transport system. This means:

- *Networks with the capacity and connectivity and resilience to support national and local economic activity and facilitate growth and create jobs.*
- *Networks which support and improve journey quality, reliability and safety.*
- *Networks which support the delivery of environmental goals and the move to a low carbon economy.*
- *Networks which join up our communities and link effectively to each other.*'

10. The Scheme has been developed to be in conformity with the NNNPS.

11. This assessment is only about the Silvertown Tunnel, as this is what the Development Consent Order (DCO) application relates to. However it should be noted that it is part of a much bigger package to improve the river crossings to the east of Silvertown, which encompasses enhancements to the Woolwich Ferry as well as potential future new crossings at Gallions Reach and Belvedere.

12. The Silvertown Tunnel is proposed in response to the three main transport problems which exist at the Blackwall Tunnel: congestion, frequent closures and a lack of resilience (owing to the lack of proximate alternative crossings). These issues lead to adverse effects on the economy and local environment. In the context of continued significant growth, these problems would only get worse, and in turn their secondary impacts would increase. Failing to address these problems could hamper the sustainable and optimal growth of London and hence the UK.

River crossings reflect the development of London

13. The limited number of east London crossings of the River Thames for highway traffic is in part a legacy of the historic pattern of the Capital's development. East of the Tower of London, the river broadens and deepens – the distance from bank to bank at Woolwich is five times the bank to bank distance at Putney. The depth of the river and the availability of relatively undeveloped land made east London the ideal centre for London's docks and wharves and industrial uses began to line the banks. Meanwhile west London attracted predominately residential and commercial uses.

14. However, the decline in London's dock's and manufacturing has provided the opportunity for the area to be redeveloped becoming a hub of the knowledge economy, a leisure destination, and home to a rapidly growing population. Together with growth in central London, this change has led to increasing demand for travel to and through the former docklands from London and the wider south-east.

15. The history of the area and the physical and engineering constraints imposed by the River Thames are reflected in the crossings constructed to date. In the east, the presence of large, sea-going ships prevented low-level bridges, and the concentration of industry along the river banks led to limited demand for cross river movements. Here the river crossings are old, few in number and limited in capacity.

16. In west London these constraints are absent. It is relatively easy to construct low-level bridges which can be used by vehicles, pedestrians and cyclists alike. These are generally cheaper than tunnels to construct, and as a consequence of demand married with feasibility, these have proliferated. On average in the centre of London, highway crossings of the River Thames are spaced 1km apart, and in west London the average distance is around 2km. In the east, the average is 8km. Yet population and population density between west and east are now not dissimilar and with much of London's population growth happening in east London, the demand for crossings would increase.

17. It is not only users of private vehicles that are disadvantaged by this paucity of road crossings: buses and coaches also need them. In west London there is at least one bus route over all but two of its bridges (the exceptions being Albert and Twickenham bridges). However in east London, the nature and limited number of road crossings acts as a major constraint on the number of bus services that can be operated.

18. Only the Blackwall Tunnel provides a suitable opportunity for a bus route, and it can only accommodate single deck buses owing to its dimensions. This service is highly adversely affected by the congestion, closures and lack of resilience of the Blackwall Tunnel. These problems undermine the feasibility of running further services through the tunnel. Of the three remaining crossings to the east of Tower Bridge, the Dartford crossing is outside London and neither the Rotherhithe Tunnel nor the Woolwich Ferry are suitable for buses.

19. Led by the regeneration of Docklands, rail crossings of the River Thames in east London have been implemented, with a further crossing to come in the form of Crossrail. This means that by 2020, there would be almost as many rail crossings to the east of Tower Bridge as to the west of Vauxhall Bridge.

This investment would have led to almost a tenfold increase in the capacity of the cross river rail network east of Tower Bridge.

20. This investment and prioritisation of rail investment has had a direct influence on the patterns of development and travel that has occurred. However, demand for road crossings has not fallen as the population in east London and associated economic activity have increased. There remains, therefore, demand for road travel, particularly for commercial traffic with 90% of all freight in London carried by road.

21. In central and west London, there is a closely-spaced series of River Thames crossings which are well-connected to the road network. This means that alternatives are available when any one of the crossings is congested, or closed (as Putney Bridge was for three months in late summer 2014).

The Blackwall Tunnel is east London's strategic highway crossing

22. In east London, however, the Blackwall Tunnel is the sole strategic highway link connecting the A2, A12 and A13 – inner east London's principal roads and it carries the most traffic on any of the river crossings in the Capital. The lack of alternative crossings is illustrated by the fact that the nearest alternative road crossings are the Rotherhithe Tunnel and the Woolwich Ferry, lying 7.5km to the west and 5km to the east respectively. However, they do not provide meaningful alternatives to the Blackwall Tunnel because they are capacity-constrained, and are not positioned to connect major arterial routes. Hence when the Blackwall Tunnel is closed or heavily congested traffic is forced to use Tower Bridge (9km away and which has weight restrictions) and the Dartford Crossing, 25km away.

Transport problems at the Blackwall Tunnel

23. Transport problems, namely congestion, closures and lack of resilience, at the Blackwall Tunnel have significant impacts. The impacts of these problems are also detrimental to non-users of the Blackwall Tunnel.

24. The strategic importance of the Blackwall Tunnel means it attracts far more traffic than it can accommodate. This is particularly the case for northbound travel in the AM peak and southbound travel in the PM peak, reflecting the fact that it connects residential areas to the south and south-east with employment and commercial centres to the north.

25. This is compounded by the fact that unlike the majority of the A2/A12 corridor which has three lanes in each direction and connects into it; the A102 (of which the tunnel is part) has only two lanes each way.

26. The extent of congestion is apparent in the extended duration of the peak period at the Blackwall Tunnel compared to most other links on the highway network. Traffic builds up from 5:00 in the morning as motorists seek to avoid the extremes in congestion which affect the northbound bore between 6:00 and 10:00. Traffic flow then remains close to capacity for much of the day, meaning that traffic on one of London's key strategic road links is routinely subject to significant delay.

27. The design of the Victorian northbound bore of the Blackwall Tunnel does not meet modern tunnel design standards for size, safety or curvature. Its narrowness means that vehicles over 4m (in the right-hand lane) and 2.8m (in the left) cannot be accommodated, which rules out larger lorries and double-deck buses. A 2m width restriction also applies. Despite considerable warning measures oversize vehicles continue to attempt to use the Blackwall Tunnel. As a consequence it suffers an abnormally high rate of incidents, including collisions, shedding of debris, and, most frequently, the attempted use by vehicles which are too tall to use it. There were 958 incidents causing northbound tunnel closures in 2013, two-thirds of which were due to overheight vehicles.

28. Whilst most closures are very brief, the volume of traffic is so high and exceeds the capacity of the tunnel for long periods of the day, that even short closures can have significant and extended impacts, adding thousands of vehicle-hours of delays over the course of a year, and making it difficult to accurately predict the length of time a journey would take for both bus passengers and private vehicle users alike.

29. Occasional serious incidents such as accidents can lead to lengthier closures, in which case these impacts are greatly amplified.

30. Continuing high levels of demand and delay and the susceptibility of the Blackwall Tunnel to closures expose a third distinct problem – a lack of resilience in the road network in the area of the tunnel. In a transport context the term 'resilience' describes the ability of transport networks to provide and maintain an acceptable level of service in the face of both planned and unplanned incidents an ageing tunnel.

31. This lack of resilience becomes most apparent in the event of closures which encourage significant numbers of vehicles to seek alternative routes. Alternative routes close to the Blackwall Tunnel do not exist, given the constraints at the nearest crossings of Rotherhithe and the Woolwich Ferry.

32. As a result, many drivers have no alternative but to divert to the Dartford Crossing, which is part of the M25 London Orbital Motorway. Since the Dartford Crossing does not have the capacity to accommodate such

additional volumes of traffic, this can result in serious congestion on the M25, one of the UK's key strategic roads, and on roads crossing the M25 in north Kent and south Essex (including the principal freight route between the Channel ports and the North of England).

Economic effects

33. These problems give rise to secondary effects on the economy. High levels of congestion and unreliability increases business costs, and results in a 'barrier effect' of the River Thames, which restricts labour and business to business catchments in some of England's most deprived areas. This 'barrier effect' is likely to be a contributing factor to lower levels of inward investment and lower land values in east London. This in turn makes the delivery of new housing and jobs more difficult in areas with London's largest concentration of development potential.

Public transport effects

34. There are 47 bus routes which cross the River Thames west of Vauxhall Bridge and only a single route crossing the River east of Tower Bridge – the 108 between Stratford and Lewisham via the Blackwall Tunnel. The 108 routinely experiences delays caused by congestion and disruption owing to tunnel closures which cause delays to passenger journeys and increase the cost of operating the service.

35. The experience of the traffic constraints affecting this bus service, together with the Tunnel's low headroom which prevents the operation of double-deck vehicles, undermines TfL's ability to provide further bus services across the river in this location.

36. Commuter coach services to and from Kent have long been users of the Blackwall Tunnel, and those using them are subject to the same problems as bus users. Coach operators report[2] that it is becoming more difficult to run reliable timetabled peak-hour services, since the variability of delay at the Blackwall Tunnel is high.

The problems now and in the future

37. London's population will continue to grow, and east London will accommodate much of this growth. GLA forecasts are that London will grow by around 1.2m people between 2011 and 2031. The boroughs in the east and south east sub-regions are expected to accommodate 37% of this growth, and the three

[2] TfL research, 2015

Silvertown Tunnel host boroughs plus the London Borough of Barking and Dagenham, to accommodate 23% of London's growth.

38. In east and south-east London, the increase in population will result in an increase in trips of around 30% on 2008 levels[3]. While many of these additional trips will be accommodated on public transport, a proportion will be made by private vehicle. The Mayor's Transport Strategy (MTS) sets out a clear commitment to sustainable transport and a continued increase in public transport, walking and cycling mode share (Policy 11). This has so far been achieved.

39. However, the significant growth in absolute numbers of trips is such that an increase in highway travel is inevitable. Furthermore, public transport alone cannot solve the three problems identified at the Blackwall Tunnel. The problems of congestion, closures and resilience can only be addressed by a road crossing.

40. The Mayor and TfL have identified possible options to address the problem of poor cross river highway connectivity and capacity in east London and following an extensive appraisal have selected a bored road tunnel at Silvertown as the preferred option[4]. This Outline Business Case examines the reasons for intervention, possible solutions and the costs and benefits of this preferred option.

The Economic Case

41. The economic analysis has been based on the DfT Transport Analysis Guidance (TAG) guidance[5], and has been summarised in three key economic results:

- present value of benefits (PVB) giving the monetised value of all user benefits arising from the Scheme;
- present value of costs (PVC) giving the cost to the public sector of constructing, maintaining and operating the new infrastructure. Revenue from user charges is included in this output and hence gives a negative number;
- net present value (NPV) for the Scheme, being the difference between the PVB and PVC values. A positive NPV indicates that a scheme would have overall benefits to the economy after costs are deducted.

[3] TfL, East London Challenges and Opportunities (2010)
[4] Silvertown Tunnel Preliminary Case for the Scheme, TfL 2015
[5] TAG, DfT, various

42. The three key economic results for the Silvertown Tunnel Scheme are given in Table 0.2. The values shown are shown in 2010 prices, and as TAG advice is that reliability benefits should normally be considered in an 'adjusted' assessment after calculating an 'initial' economic assessment, most of the analyses that follow are shown with both 'initial' and 'adjusted' (with reliability benefits) outcomes.

43. The Scheme has a positive Net Present Value of £976m (without the inclusion of reliability benefits) and £1,273m (with reliability benefits) over 60 years – it is therefore a scheme with a very positive economic outcome. This conclusion is supported by an assessment of the NPV compared to the investment cost i.e. it describes the total benefit per pound of capital expenditure, which in the present case is 1.8 (initial) and 2.3 (adjusted for reliability).

Table 0.1 Summary economic results (£m, 2010 prices)

Economic measure	Initial (without reliability benefits), £m	Adjusted for reliability benefits, £m
Present value of benefits (PVB)	£971	£1,268
Present value of costs (PVC)[6]	-£5	-£5
Net present value (PVB-PVC)	£976	£1,273

44. Within the overall summary, the main impact by user or provider groups is shown in Table 0.2 and Table 0.3 (the latter shows the additional reliability benefits for road users as described above).

45. Both tables show in the second column that all user classes (commuting, business and other trips) have positive net benefits (benefits less charges) over the 60 year appraisal period – in total this amounts to £1,069m net benefit (£1,367m with reliability added).

46. The tables also show high net user benefits for all vehicle types when reliability benefits are included, apart from Heavy Goods Vehicles (HGV's).

47. It should be noted in relation to HGV's that TfL proposes to vary the charge by vehicle type to reflect the amount of road space occupied, the contribution to

[6] A negative cost means a surplus of revenue over costs, in this case due to revenue from the crossing user charge

congestion, the emissions and the wear and tear to the road surface caused by different types of vehicles. Consequently HGV's pay the highest charges, and this impacts their net user benefits. There are also indications that the value placed in the current appraisal on reliability of goods vehicles is an underestimate – for example the Freight Transport Association (FTA) calculated that each minute of delay related to unreliability costs an operator £1; a delay of 20 minutes at the Blackwall Tunnel could therefore, add £20.00 to the cost of an individual trip[7], considerably more than the value currently placed on this impact. The employer survey for the scheme also found that nearly a third of respondents in sectors that typically use HGVs said the Scheme would increase their customer base even taking into consideration the charge for using it, compared to just 4% that thought it would have a negative effect .[8]

48. A summary therefore is that car users, coach and bus passengers have overall high net benefits from the appraisal, LGV's have smaller net benefits and HGV's have some net disbenefits.

Table 0.2 Summary economic results (initial) by users (£m, 2010 prices)

User Class	Total	Cars	LGV	HGV	Coach	Bus
Commuting	£259	£11			£120	£128
Other	£474	£71				£403
Business	£337	£447	-£40	-£130		£60
Total	**£1,069**	**£529**	**-£40**	**-£130**	**£120**	**£591**

[7] FTA concerned over journey time reliability for road freight operators Press release May 21, 2015
[8] Silvertown Tunnel Business Survey 2013-2015 WSP

Table 0.3 Summary economic results (adjusted for reliability benefits) by users (£m, 2010 prices)

User Class	Total	Cars	LGV	HGV	Coach	Bus
Commuting	£291	£44			£120	£128
Other	£556	£153				£403
Business	£519	£539	£26	-£107		£60
Total	**£1,367**	**£737**	**£26**	**-£107**	**£120**	**£591**

49. It should be noted that all these estimates are based on the use of national values of time in the appraisal, as recommended in TAG. However TfL's Business Case Development Manual (BCDM) recommends that given known higher London wages and productivity, higher London-specific values of time should be used in appraisal given the higher levels of pay in London. A sensitivity test using these values is described in the EAR, and shows a significant uplift in user benefits (some 32-33%) and in net user benefits (59-66%).

50. The conclusion from the economic case is that the Silvertown Tunnel scheme:

- has a very positive economic outcome in terms of an NPV of £976m to £1,273m (the latter when reliability benefits are included) over 60 years. This would increase significantly if London values of time were used in the appraisal.
- all user classes apart from HGV's experience net benefits (time and vehicle operating cost benefits less user charges); HGV's show a net disbenefit, but this is due to the higher charge these vehicles pay; the value placed on their reliability saving is also likely to be an underestimate.
- in line with the Mayor's objectives, supports sustainable movement, as over half of the user benefits come from bus and coach passengers; and
- in line with scheme objectives, the scheme significantly reduces congestion and improves reliability.

51. The conclusion is that, taking all the economic and other factors into account, the Scheme provides very good value for money. Overall it is clear that there is a very strong economic case for the scheme.

Regeneration

52. East London is a highly deprived area that has considerable potential to accommodate the housing and commercial development needed to support London's economy. The River Thames is a major barrier to cross river traffic for both commuters and businesses. The existing Blackwall Tunnel is badly congested leading businesses to incur additional costs thereby imposing inefficiencies on the sub-regional economy.

53. Silvertown Tunnel is one element of a wider strategy that aims to address these barriers and hence facilitate the regeneration of the area. It clearly provides the additional capacity and connectivity to reduce business costs, increase the size of the labour market, increase the potential customer base, improve the attractiveness of the area, and therefore support national and local economic activity, job creation and regeneration, in one of the UK's most disadvantaged areas.

54. Part of the Scheme is the creation of a new strategic bus corridor with the capacity to carry more than 9,000 people in each direction during the peak periods. This would significantly improve connectivity between south-east and east London, particularly to parts of the Royal Docks, where there are plans to accommodate tens of thousands of new jobs.

55. The improvements in economic performance expected to be supported by the Scheme are likely to make the area more attractive to inward investment, raising land values and facilitating the quicker delivery of employment and housing development.

Wider Impacts

56. Transport schemes are likely to have impacts not only in the transport market but also in the labour, product and land markets. These are known as Wider Impacts (WI). Analysis following TAG principles has estimated the benefits from the following WI measures:

- WI1- Agglomeration: firms derive productivity benefits from being close to one another and from being located in large labour markets. These impacts appraise the effect of implementing a transport scheme that brings firms closer together and closer to their workforce. This effect has been estimated at £37.9m for the Scheme (over 60 years, discounted in 2010 prices).

- WI2- Output change in imperfectly competitive markets: standard transport appraisal takes into account the time savings for business, and when this occurs output is also expected to increase - this

additional output increases the benefits obtained by consumers and the value of this is estimated at £60m for the Scheme.

- WI3- Tax revenues arising from labour market impacts: people make commuting decisions based on their income after taxes. Therefore, the value of time used for time savings doesn't include exchequer benefits that happen in practice when people make different decisions about employment as a result of a transport scheme. For the Scheme the impact of labour supply impacts was estimated. This analyses the effect on taxes due to a change in the number of people attracted into work as a result of an improvement in travel costs, and for the scheme this is estimated to be £7m.

Social and Distributional Analyses

57. The distributional impacts appraisal compares the distribution of scheme benefits against the distributions of specific social group populations to assess the extent to which scheme benefits are experienced by those groups compared with the general population.

58. There were moderate beneficial impacts assessed relating to user benefits, accidents and accessibility by public transport and slight beneficial impacts relating to severance and noise. User charges (not including time saving benefits) have a slight adverse impact on low income users and a large adverse impact on medium and high income users. Benefits from provision of new public transport services and mode switching to these would be of benefit in particular to low income users. Overall, given the focus on low income groups, the impact on personal affordability has been assessed as neutral. Air quality impacts have both been assessed as moderate beneficial.

59. A social impacts analysis reviewed the social impact upon users of the crossings and people living or working in its vicinity. This found that the Scheme would have large beneficial impacts on travellers' journey quality due to the reduction in congestion and improvement in reliability; that introduction of new public transport services would have moderate beneficial impacts on accessibility, accidents and option/non-use values, and slight beneficial impacts on physical activity with a small shift from other motor vehicles to public transport, with associated active mode trips. There would be a neutral impact on personal affordability (for the reasons noted in the distributional analysis above) and on security and severance.

The Financial Case

60. The Financial Case sets out the project cost, the funding available to deliver the scheme and the proposed financing arrangements including the accounting treatment.

61. The project currently has an Estimated Final Cost (EFC) of £792m (outturn price, including risk and inflation although further design work is being undertaken which may see this figure revised. The EFC comprises of £90m for TfL's delivery costs, including planning, procurement, land acquisition, project management and £702m for contractor design and construction costs.

62. The value of the investment costs (in 2010 prices discounted to 2010) is £553m.

63. Operating costs for the collection of the road user charge have been provided by TfL. These costs include elements such as transactional charge costs, and monthly maintenance costs for the Automatic Number Plate Recognition (ANPR) cameras. The Silvertown Tunnel charge collection operating costs are based on the traffic flows. Traffic flows for intermediate years between 2021, 2031 and 2041 have been interpolated on a straight-line basis, between the values for the three model forecast years (2021, 2031 and 2041). Charge collection costs beyond 2041 to 2080 have been assumed at the 2041 value.

64. Operating costs have also been provided by TfL. These costs were converted to 2010 prices, adjusted for indirect taxation and discounted over 60 years. The total discounted cost associated with user charge collection is about £436m (2010 prices).

65. Maintenance costs have been estimated by TfL to allow for routine tunnel maintenance, reactive tunnel maintenance, and tunnel services (electricity and water) for the appraisal period. Both the routine and reactive tunnel maintenance comprises elements for maintenance of the road infrastructure and for the traffic control equipment. These costs are estimated at £101m (2010 price discounted to 2010).

66. TfL proposes to use a Public-Private-Partnership (PPP) contract for the Scheme. The project has characteristics which make it a suitable candidate for delivery via this means, and although the use of private finance may mean that the financing cost is greater than if TfL finances itself, it does have a number of key advantages:

    - risk is effectively transferred to the party who is best placed to manage it, improving value for money;

- total costs are minimised as the private sector can take advantage of whole life costing as they are responsible for the design, construction and ongoing maintenance of the asset;
- there is greater opportunity for the private sector to reduce cost through innovation as the performance standards of the tunnel are specified, rather than the design or construction method;
- services are focused on end user satisfaction through performance based payments;
- there are also advantages for TfL in that the payment of scheme costs is deferred until the scheme is operational, which allows TfL to invest in other schemes; and
- repayment of private finance can also be spread out over time, allowing TfL to use revenues generated from user charging to contribute to the cost of the tunnel.

67. A PPP contract solution would see the private sector take on the responsibilities for design, construction, finance and maintenance risks of the project, in return for a series of payments by TfL made from the date of opening the tunnel for the period of the operating contract, which is likely to be 25 to 30 years.

68. As part of the project, it is proposed that road user charging is introduced on both Blackwall and Silvertown Tunnels to help manage the traffic demand at both crossings and to help pay for the construction and operation of the new tunnel. TfL expects that revenue collected would over time cover the cost of the scheme and may also play a part in funding other future transport investment in London.

The Commercial Case

69. TfL is proposing to deliver Silvertown Tunnel by entering into a long term PPP contract as highlighted above. At the end of the contract the asset would be handed back to TfL.

70. TfL would make regular payments to the private sector party once the tunnel is operational. Deductions would be made from these payments to the extent that the private sector party fails to meet the specified availability, performance and safety requirements. TfL would control the day to day operation (e.g. traffic management) of Silvertown Tunnel and Blackwall Tunnel would continue to fall under existing operations and maintenance arrangements.

71. TfL would be responsible for setting and collecting the user charges on both Silvertown and Blackwall Tunnels. Within this structure, there is flexibility over the delivery and operation of the user charging system. This could either be integrated into the existing congestion charge system or procured as a separate collection contract.

72. Other commercial models such as Design, Build, Finance, Transfer and Regulatory structures have been considered, but are not suitable as they have significant drawbacks in terms of affordability and value for money.

73. The risk allocation approach is to pass over risks that the private sector can control or manage therefore being able to price with confidence. This approach helps to achieve value for money as certain private sector organisations have more experience in construction of complex schemes and are therefore better equipped to manage and mitigate certain risks.

74. TfL are proposing to adopt an availability based structure where payments are based on the level of asset availability for use. Deductions are applied where the crossing is not available in full or in part. There is a strong appetite amongst both debt and equity investors for availability based road structures and strong competition between bidders can be expected. For example, the Mersey Gateway Bridge attracted c. £600m of investment last year.

75. A PPP contract for Silvertown Tunnel and any ancillary contracts, such as the user charging collection system, would be competitively tendered via EU compliant means in the Official Journal of the European Union (OJEU). It is currently being assumed that either a competitive dialogue or negotiated procedure would be adopted to allow bidders to develop alternative proposals to meet TfL's requirements. This would encourage innovation as well as maintain competitive pressure during the bidding process.

The Management Case

76. The purpose of the Management Case is to assess whether a proposal is deliverable. It reviews evidence from similar projects, sets out the project planning, governance structure, risk management, communications and stakeholder management, benefits realisation and assurance.

77. TfL has extensive experience in developing, promoting and implementing significant infrastructure projects. This ranges from modifications to existing infrastructure (such as London Underground or Dockland Light Railway (DLR)) to major schemes such as Crossrail.

78. The Development Consent Order (DCO) process that would be used for Silvertown Tunnel is a relatively new procedure. While much of TfL's project

development experience would be transferrable to this scheme, there would be a need to seek additional support as required.

79. The Silvertown Tunnel project is sponsored by the Director of Asset Management within Surface Transport, with a lead sponsor embedded in the integrated project team.

80. The current anticipated key milestones for the project are shown below.

Table 0.4 : Estimated key project milestones

Milestone Description	**Date**
Statutory Consultation	5 October to 27 November 2015
DCO Submission	March 2016
Procurement process launched	April 2016
DCO examination period	April 2016 – February 2017
Secretary of State decision	Summer 2017
Contract award	Summer 2018
Start of construction	Autumn 2018
End of construction	Winter 2022/23

Conclusions

81. The Silvertown Tunnel scheme comprises a new road tunnel between Silvertown and North Greenwich, close to the Blackwall Tunnel. A user charge is proposed for both tunnels once the new tunnel is operational.

82. The Scheme is proposed in response to the three main transport problems which exist at the Blackwall Tunnel: congestion, frequent closures and a lack of resilience (owing to the lack of proximate alternative crossings). These issues lead to adverse effects on the economy and local environment. In the context of continued significant growth, these problems can only get worse, and in turn their secondary impacts would increase. Failing to address these problems could hamper the sustainable and optimal growth of London and hence the UK.

83. The Scheme is part of a wider package of cross-river proposals that includes the Woolwich Ferry and crossings at Gallions Reach and Belvedere, as well as a new public transport crossing from Crossrail. TfL is also considering

crossings in this area for pedestrians and cyclists, such as the Isle of Dogs-Rotherhithe bridge proposal put forward by Sustrans.

84. The importance of an effective river crossing in east London for national growth is recognised in the designation of the Scheme as a nationally significant infrastructure project (NSIP). The designation letter states that congestion at the Blackwall Tunnel is having an impact on the national road network which the Silvertown Tunnel scheme would help to address. Critically, it highlights why the proposal has national significance.

85. Given the position of London as an economic driver nationally, any decrease in efficiency in London's transport network may have a consequential detrimental impact nationally.

86. The introduction of the Silvertown Tunnel and a user charge at both Blackwall Tunnel and Silvertown Tunnel would significantly reduce day-to-day journey time variability and deliver congestion-relief benefits during peak times on the main approach roads to the Tunnels; including the A102, the A12 and the A13. The user charge is critical in ensuring that traffic levels are managed and that the benefits of the scheme are locked-in for the longer-term, and also helps to pay for the scheme.

87. The most important impact on public transport is the opportunities the Silvertown Tunnel would create for new cross-river bus services to improve public transport links between south-east and east London, notably the growing employment areas in the Royal Docks and Canary Wharf. The Silvertown Tunnel is designed to accommodate double-deck buses, thus providing operational flexibility for the bus routes that could be extended across the River Thames, as well as greater capacity.

88. There is a clear and robust **case for change** for a new tunnel at Silvertown, to address current congestion and unreliability and to cater for the needs of future economic growth. This 'strategic case' is closely related to national, London-wide and local road policy objectives, with a particular reference to the London Plan and the Mayor's Transport Strategy.

89. The analysis demonstrates that the scheme is excellent **value for money** – it has a high net present value and is a scheme that can be primarily delivered and funded by user charges.

90. The scheme is **commercially viable** – the report sets out the procurement, commercial structure, and proposed allocation of risk and payment mechanisms for the project.

91. The scheme is financially **affordable** – the ‘financial case’; the analysis sets out the project cost, describes the primary private funding mechanism available to deliver the scheme and the proposed financing arrangements.

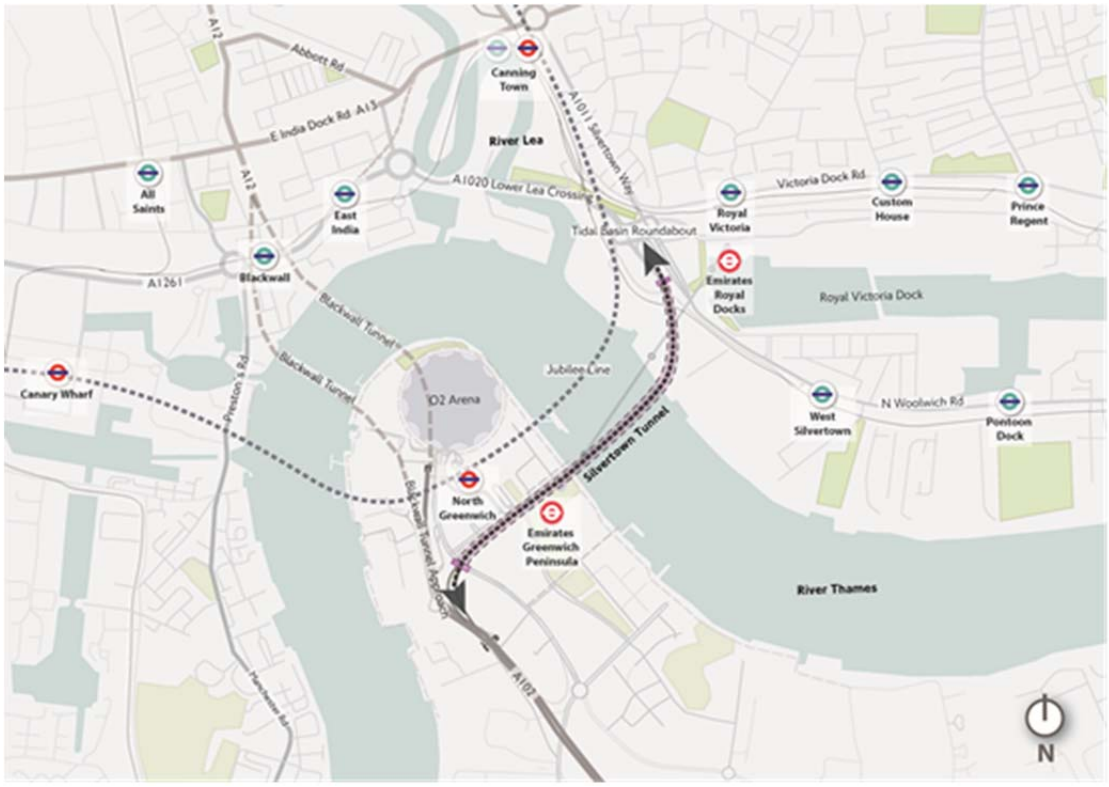
92. The project is **achievable**- the ‘management case’ sets out a clear governance, process and programme for the further development of the scheme by TfL, an authority with a very successful experience and record in major project delivery.

1. INTRODUCTION

1.1 Description

1.1.1 Transport for London (TfL) is proposing to construct a new bored tunnel under the River Thames between the Greenwich Peninsula and Silvertown to relieve the current congestion and resilience issues at the Blackwall Tunnel and to cater for future growth – 'the Silvertown Tunnel' or 'the Scheme'. This report is the Outline Business Case for the project. Figure 1-1 shows the proposed location of the Silvertown Tunnel, situated in east London adjacent to the existing Blackwall Tunnel.

Figure 1-1 Silvertown Tunnel location



1.2 The approach to the business case

1.2.1 The purpose of a business case is to provide evidence-based information to decision makers, in this context the Mayor of London, in relation to investment programmes. Guidance for the preparation of Business Cases for Transport Schemes has been published by the DfT[9]. This is based on H.M. Treasury's advice on evidence-based decision making as set out in

[9] See https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/85930/dft-transport-business-case.pdf - accessed 5 September 2014

the Green Book[10] and uses the best practice five case model approach. This approach assesses whether schemes:

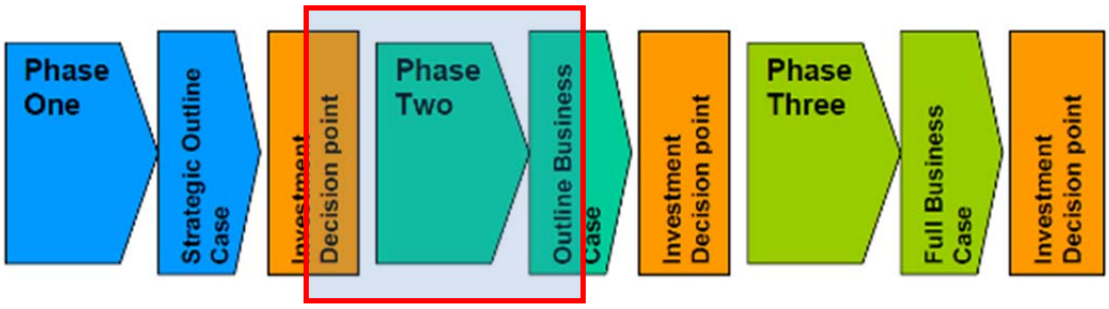
- are supported by a robust case for change that fits with wider public policy objectives – the 'strategic case';
- demonstrate value for money – the 'economic case';
- are commercially viable – the 'commercial case';
- are financially affordable – the 'financial case'; and
- are achievable – the 'management case'.

1.2.2 The evidence gathered as part of the business case preparation process has been prepared using the tools and guidance provided by the DfT, notably TAG[11].

1.3 Decision making process

1.3.1 The decision making process, of which this Outline Business Case forms part, usually takes place in three phases. Each phase includes the preparation of a business case followed by an investment decision point. Each business case builds upon that previously prepared. Evidence is reviewed to ensure that it remains up to date, accurate and relevant. The current Outline Business Case is in Phase Two as shown in Figure 1-1 Silvertown Tunnel location.

Figure 1-2 Business case processes



1.3.2 Phase One of this project has already been completed. In this phase, the need for the intervention was established and a range of options developed and considered. This resulted in a proposal (Proposal 39)

10 https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/220541/green_book_complete.pdf accessed 5 September 2014
11 See https://www.gov.uk/transport-analysis-guidance-TAG accessed 5 September 2014

supporting new river crossings in the 2010 Mayors Transport Strategy. The analysis for the MTS policy on a package of crossings provided the required depth of initial analysis to establish the need for the project and to consider various options.

1.3.3 Drawing on analysis and evidence in these documents and in consultation responses to them a project-specific 'Assessment of Needs & Options – Silvertown Crossing' report[12], was developed in October 2014 for the project. At the same time an initial Outline Business Case was developed – this is superseded by the current Outline Business Case, which has been updated to reflect changes to the scheme, updated transport models and updated guidance.

1.3.4 The current report concentrates on the detailed assessment of the preferred option, a bored tunnel at Silvertown, and this report:

- confirms the project's suitability towards achieving the Mayor's and TfL's objectives;
- confirms the strategic fit and the case for change;
- refines the investment/intervention proposal; and
- provides details of the project's overall balance of benefits and costs against objectives.

1.3.5 The report also draws on updated information contained in the Preliminary Silvertown Tunnel Transport Assessment (TfL, September 2015).

1.3.6 The final phase in the process, Phase Three, would result in the production of the Full Business Case. At this point all the required evidence and information would have been assembled and be sufficient to enable TfL and the Mayor to decide whether the proposal should proceed to implementation.

1.4 The role of the Mayor of London and TfL

1.4.1 This investment proposal is made by TfL. TfL is a statutory body created by the Greater London Authority (GLA) Act 1999. This Act gives the Mayor of London a general duty to develop and apply policies to promote and encourage safe, integrated, efficient and economic transport facilities and services to, from and within London. TfL is the body responsible for delivering these services on the Mayor's behalf. TfL also has a network management duty under the Traffic Management Act 2004.

[12] Silvertown Tunnel, Assessment of Needs and Options, TfL, 2014

1.4.2 TfL is responsible for operating, maintaining and improving the strategic road network in Greater London, including the majority of River Thames crossings for vehicular traffic (bridges, tunnels and the Woolwich Ferry) within Greater London.

1.4.3 The MTS is the principal policy tool through which the Mayor exercises his responsibilities for the planning, management and development of transport in London, for both the movement of people and goods. It takes into account the policies in the London Plan and the Mayor's Economic Development Strategy (EDS). It provides the policy context for the more detailed plans of the various transport-related implementation bodies, particularly TfL and the London boroughs.

1.5 River Crossings Programme

1.5.1 The Silvertown Tunnel is one of a number of proposed new and enhanced river crossings between east and south-east London. Their purpose is to address issues related to the ageing infrastructure of the existing crossings – notably the Blackwall Tunnel and the Woolwich Ferry – but also to provide capacity needed to enable the development of the east London sub-region.

1.5.2 All recent additional river crossings in the east sub-region have been provided to enhance public transport connectivity in the area. These crossings – on the Docklands Light Railway, the Jubilee Line, the extended London Overground and the Emirates Air Line – have to a significant extent helped to facilitate development in London's Docklands. Further development of the public transport links would follow with the opening of Crossrail to Abbey Wood, passing beneath the River Thames between Custom House and Woolwich stations. These developments are improving the ease of travel around London especially for cross-river journeys supporting London's growth. There is also ongoing TfL work into options for cross-river pedestrian/cycling facilities.

1.5.3 In contrast, the most recent upgrade to vehicular crossings was in 1967 with the opening of the second Blackwall Tunnel. Since many journeys cannot be made by rail based public transport (e.g. 90% of freight/deliveries in London are reliant on road transport), it is important to improve conditions for road traffic. Additional cross-river capacity is required for buses, taxis, goods vehicles and private cars supporting businesses and employment. It is evident from the level of road congestion in east London, and at the Blackwall Tunnel in particular, that investment in the road network has not kept up with increasing demand and is a constraint on planned growth.

1.5.4 A range of schemes and locations have been put forward for consideration as part of the River Crossings programme, and Figure 1-3 shows the Silvertown Tunnel in relation to other crossings options proposed. Other locations that have been assessed as being potentially suitable for new river crossings are at Woolwich, Gallions Reach and Belvedere. TfL also supports DfT investigations of the new Lower Thames Crossing, which would provide additional capacity at the Dartford Crossings.

Figure 1-3 Options for east London River Crossings Programme

1.6 Consultation to date on the scheme

1.6.1 The public consultations held on the River Crossings programme and on the Silvertown Tunnel are described in the Case for the Scheme report, and are summarised below.

1.6.2 In February 2012, TfL held an initial four-week consultation with stakeholders and members of the public on proposals for a new road tunnel at Silvertown and a new vehicle ferry at Gallions Reach. Approximately 3,900 responses were received, with 93% agreeing that more river crossings were required.

1.6.3 A second non-statutory consultation on the River Crossings programme was held in October 2012 to February 2013. As well as a new tunnel at Silvertown, it sought views on the replacement of the Woolwich Ferry and options for a fixed crossing at Gallions Reach. There was a high level of support for the option of a new road tunnel between Silvertown and the Greenwich Peninsula, with 76% supporting it (57% strongly support and 19% support). This consultation also set out that that the Blackwall and Silvertown tunnels would be charged in order to pay for the scheme and

to manage traffic. Just over half of those responding via the questionnaire expressed opposition to a charge for the new crossings and Blackwall Tunnel, with 55% opposing it (40% strongly oppose and 15% oppose). A third of the consultation respondents supported the charging option (19% support and 14% strongly support).

1.6.4 There was a first non-statutory consultation on the Silvertown Tunnel scheme between October and December 2014. The bored tunnel option was presented in greater detail with regard to alignment, capacity, design, junction tie-ins, construction method and sites and associated topics. This was the first consultation which focused solely on the Silvertown Tunnel scheme. The questionnaire with the consultation revealed that 83% agreed that a new river crossing was needed at this location. Just over half (55%) opposed the user charge, with 37% supporting it. In general there was support for the junction changes (48% at north side and 54% at south side), with a substantial proportion responding 'don't know'. There were many suggestions about new bus connections and services.

1.6.5 Following this consultation TfL gave approval for preparation for submission of a Development Consent Order (DCO). The current consultation is the statutory consultation for a DCO, which is expected to be formally applied for in early 2016.

1.7 Structure of this report

1.7.1 The remainder of this report includes:

- Chapter 2- outlining the strategic case, or policy-fit and need for the scheme
- Chapter 3 – which describes the economic case and Value for Money
- Chapter 4- which summarises the commercial case and commercial viability of the scheme
- Chapter 5- which outlines whether the scheme is financially affordable – the financial case
- Chapter 6- sets out whether the scheme is achievable – the management case
- Chapter 7- draws conclusions.

2. THE STRATEGIC CASE

2.1 Introduction

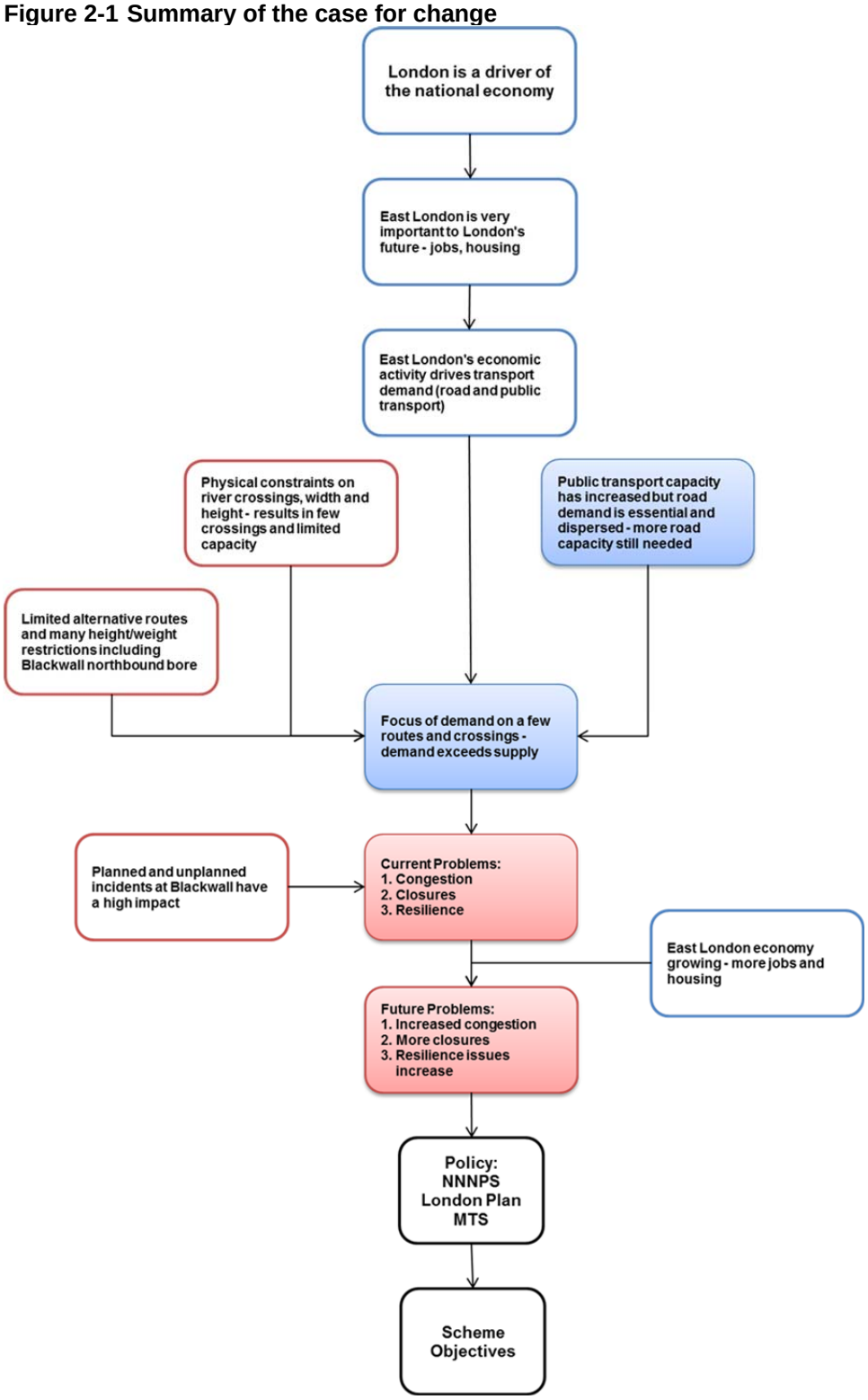
2.1.1 The Strategic Case is the first of the five cases forming the Transport Business Case. Its purpose is to set out the need for investment in the transport system, describe the rationale for making the investment, and how the investment meets the stated aims and objectives.

2.1.2 The strategic case for the scheme is discussed in four broad sections, as summarised below:

- the strategic policy context – national, regional and local policy guidance;
- the current socio-economic and transport context and need for the scheme;
- future growth opportunities in the area and finally; and
- the case for change, a summary of the overall issues the scheme seeks to address.

2.1.3 Figure 2-1 summarises the overall case for change, which is at the heart of the strategic case - more information on each element is set out in the text that follows- the first section summarises relevant policy.

Figure 2-1 Summary of the case for change



2.2 Strategic policy context

2.2.1 Existing national, regional and local policies give general and specific support to new road-based river crossings in east London, particularly at

Silvertown, to address strategic and local needs for cross-river accessibility and to relieve congestion and to improve reliability and resilience. The policy context is described in detail in the Preliminary Transport Assessment (TA) [13] and is summarised below.

National planning and government policy

2.2.2 The Silvertown Tunnel was designated a Nationally Significant Infrastructure Project (NSIP) on 26 June 2012 by a Section 35 Direction made by the Secretary of State for Transport. This set out the following four reasons for designating the scheme:

- London as an engine for economic growth nationally;
- the projected growth of London;
- current congestion at the Blackwall Tunnel is having a direct impact on the strategic road network; and
- the size and nature of the Silvertown Tunnel and comparison to other NSIPs.

2.2.3 Silvertown Tunnel's NSIP designation means that the scheme must comply with the policy tests set out in the National Networks National Policy Statement (NNNPS), 2015. However the NNNPS states at paragraph 1.3 that in the circumstances of a S.35 Direction:

'the relevant development plan is also likely to be an important and relevant matter especially in respect of establishing the need for the development'.

2.2.4 In this case the relevant development plan is the London Plan, 2015[14] and the local plans of the host boroughs – Royal Borough of Greenwich and London Boroughs of Newham and Tower Hamlets.

National Networks National Policy Statement (NNNPS) 2014

2.2.5 On 17 December 2014 the final version of the NNNPS was published with formal designation occurring in January 2015. The Planning Act 2008 requires applications to be decided in accordance with the relevant National Policy Statement. For road schemes the National Networks National Policy Statement (NNNPS) is the relevant National Policy Statement.

[13] Silvertown Tunnel Transport Assessment, TfL, 2015
[14] Further Alterations to the London Plan (FALP), GLA, 2015

2.2.6 The NNNPS does not reference specific schemes but rather sets out the principles by which applications for schemes should be assessed. Paragraph 4.3 sets out how in considering any proposed development the Examining Authority should take into account:

'its potential benefits, including the facilitation of economic development, including job creation, housing and environmental improvement, and any long-term or wider benefits:

its potential adverse impacts, including any longer-term and cumulative adverse impacts, as well as any measures to avoid, reduce or compensate for any adverse impacts'

2.2.7 In the 'Summary of Need' at the start of section 2 the NNNPS sets out what road and rail NSIP schemes such as Silvertown Tunnel need to deliver:

'The Government would deliver national networks that meet the country's long term needs; supporting a prosperous and competitive economy and improving overall quality of life, as part of a wider transport system. This means:

Networks with the capacity and connectivity and resilience to support national and local economic activity and facilitate growth and create jobs.

Networks which support and improve journey quality, reliability and safety.

Networks which support the delivery of environmental goals and the move to a low carbon economy.

Networks which join up our communities and link effectively to each other.'

2.2.8 The scheme has been developed to be in conformity with the NNNPS. This is detailed and analysed further in chapter 7.

2.2.9 The following national planning policy documents are relevant to the scheme; in planning terms they are a material consideration:

- National Planning Policy Framework (NPPF) 2012

Other national strategies:

- Road Investment Strategy 2015/16 – 2019/20
- Strategic Road Network Policy, 2013
- Action for Roads: A network for the 21st century, 2013

National Planning Policy Framework (NPPF) 2012

2.2.10 The NPPF, published by the Department for Communities and Local Government in March 2012 sets out the Government's planning policies for England. Paragraph 3 of the NPPF sets out how the Framework does not contain specific policies for NSIP schemes for which particular considerations apply. These are determined in accordance with the decision-making framework set out in the Planning Act 2008 and relevant national policy statements for major infrastructure, as well as any other matters that are considered both important and relevant (which may include the NPPF).

Road Investment Strategy 2015/16 – 2019/20

2.2.11 This Department for Transport strategy sets out a vision for the future development of the strategic road network. It emphasises the role of the strategic road network in:

- providing capacity and connectivity to support national and local economic activity;
- supporting and improving journey quality, reliability and safety;
- joining communities and linking them effectively to each other; and
- supporting delivery of environmental goals and the move to a low carbon economy.

Strategic Road Network Policy, 2013

2.2.12 This Department for Transport document focuses on the management of the strategic road network and the role of Highways England in local plan making and capacity enhancement. It sets out the importance of a well-functioning strategic road network in enabling growth by providing for safe and reliable journeys.

Action for Roads: A network for the 21st century, 2013

2.2.13 This report by HM Treasury sets out the Government's plans to upgrade the strategic road network. It explains in paragraph 1.5 that the road network is the *'life-blood of the economy'*.

Regional – London policy

2.2.14 The scheme is located within east London and therefore London planning policy is applicable. The latest development plan documents at a London (regional) level comprise:

- Mayor's Transport Strategy (MTS), 2010
- The London Plan, March 2015

Other relevant London policy strategies include:

- London Infrastructure Plan 2050 Update.

Mayor's Transport Strategy (MTS), 2010

2.2.15 The MTS is a statutory document, together with the London Plan and Economic Development Strategy it forms part of a strategic policy framework to support and shape the economic and social development of London. It was published in May 2010.

2.2.16 The development of the MTS policy on river crossings was informed by a 2009 review of river crossing options. This work made it clear that a solution had to be found to address the problem of the Blackwall Tunnel but also that a package of river crossings would be required.

2.2.17 The MTS at 5.8 sets out the need for new river crossings in east London and the need for:

'additional road-based river crossings in east London as part of a package of transport improvements'

2.2.18 Proposal 39 sets out that the Mayor would take forward a package of river crossings which would include:

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

2.2.19 Proposal 130 refers to consideration of managing demand through pricing. In particular it states that

'The Mayor will also consider imposing charges or tolls to support specific infrastructure improvements, such as river crossings'.

London Plan, March 2015

2.2.20 The London Plan is the spatial development strategy for London. It is produced by the Mayor of London through the Greater London Authority. Local development documents produced by London boroughs must be in conformity with the London Plan. This version was first published in July 2011. It was updated in 2013 to ensure conformity with the NPPF and draft further alterations were consulted on in 2014 with the consolidated plan published in March 2015.

2.2.21 Chapter 3 of the London Plan sets out the need for river crossings in east London which include:

'a new road-based tunnel crossing between the Greenwich Peninsula and Silvertown' (6.20)

London Infrastructure Plan 2050 Update

2.2.22 This Mayor of London document sets out a long term infrastructure plan for London. Chapter 6 focuses on transport and states the support for new river crossings in east London and how TfL is actively progressing three new river crossings – Silvertown Tunnel, Gallions Reach and Belvedere.

Local development plans

2.2.23 The scheme is located within the administrative boundaries of three host London Boroughs (LB) – LB Tower Hamlets, LB Newham and the Royal Borough of Greenwich – the detail of the relevant local plan policies is provided in the Transport Assessment, but key points are summarised below.

Royal Borough of Greenwich

2.2.24 The Royal Borough of Greenwich's Core Strategy[15] sets out how the borough is committed to supporting transport schemes that are critical to the borough's development and states that they would '*advocate and work in partnership with relevant agencies to deliver a new package of Thames river crossings in east London, including the continued safeguarding of the Silvertown Link Tunnel'* (Core Strategy policy IM3). The Core Strategy states that this new river crossing would improve connectivity between the Greenwich Peninsula (the focus of development in Greenwich, with 14,000 new homes planned) and the north side of the Thames (paragraph 3.3.20).

2.2.25 Greenwich's Second Local Implementation Plan (LIP)[16] discusses river crossings in Section 3 and gives support in principle to *'a vehicle tunnel from the A102 on Greenwich Peninsula to Silvertown'*. In Section 4, the LIP sets out the need for road-based river crossings to support the population and employment growth planned for the borough, particularly to improve radial connectivity into London. The LIP states that 'the proposed package of three crossings at Silvertown, Woolwich and

[15] Royal Borough of Greenwich: Core Strategy with Development Management Policies (Submission Version) with proposed modifications, 2013
[16] Royal Borough of Greenwich: Keeping Greenwich Moving - Greenwich Council's Second Local Implementation Plan for Transportation (June 2011)

Thamesmead remains critical to successful economic development through improved access to employment opportunities north of the river'.

2.2.26 The Greenwich Peninsula West Masterplan Supplementary Planning Document (SPD)[17] was adopted in April 2012. The SPD provides a masterplan to guide the development planned for this area. Section 4 of the SPD discusses key movements in the area and notes that the A102 which forms the entryway to the Blackwall Tunnel is a major traffic artery linking both sides of the Thames. The SPD goes on to state that '*proposals for an additional road link from [the] Peninsula to Silvertown should ideally be below ground to minimise the impact of increased traffic in the area'*.

London Borough of Newham

2.2.27 The London Borough of Newham's Core Strategy[18] gives support for new river crossings that would contribute towards Newham's regeneration and economic and physical development. It states that '*the Council supports the development of bridge, tunnel or ferry crossings at these locations [Silvertown and Gallions Reach] to provide resilience to the Blackwell Tunnel and to support future growth'* (paragraph 6.197).

2.2.28 Newham's Second LIP[19] states that the council has a 'serious concern that its [east London's] further development would be hindered by the lack of a suitable road-based river crossing ensuring the efficient flow of both goods and visitors to the Centre both north and south of the Thames' (paragraph 2.6.32). The LIP sets out the Council's support for strategic transport proposals that would contribute towards Newham's regeneration and economic and physical development and specifically notes a new river crossing at Silvertown in paragraph 2.6.100. The Council's notes that its support for this crossing is subject to its delivery as part of a package (along with a crossing at Gallions Reach) and the mitigation of impacts on the Canning Town area (paragraph 3.2.8).

London Borough of Tower Hamlets

2.2.29 The London Borough of Tower Hamlets' Core Strategy[20] was adopted in September 2010. The Core Strategy provides support for river crossings

[17] Royal Borough of Greenwich: Greenwich Peninsula West Masterplan SPD, April 2012
[18] London Borough of Newham: Newham 2027 Newham's Local Plan – The Core Strategy, January 2012

[19] London Borough of Newham: 2nd Local Implementation Plan - Transport Policies and Programmes Document, April 2011

[20] London Borough of Tower Hamlets: Core Strategy 2025, September 2010

to North Greenwich for the improved accessibility, permeability and connectivity that would be provided to Leamouth, a regeneration area adjacent to the north side of the proposed Silvertown Tunnel where new homes and jobs are being delivered (LAP 7&8, Leamouth).

2.2.30 Tower Hamlets' Second LIP[21] (containing a Delivery Plan extending to 2016/17 for major schemes) was adopted in May 2011. The LIP includes details of schemes of relevance to Tower Hamlets set out in TfL's east London Sub-Regional Transport Plan, including 'Silvertown Tunnel' proposals and notes that these have been taken into account in the preparation of the Borough's Transport Objectives and Delivery Plan. The LIP sets out the Council's support for improving the provision of river crossings to relieve pressure on the borough's road network, particularly Blackwall Tunnel (page 38).

Strategic context conclusion

2.2.31 Existing national, regional and local policies thus give both general and specific support to new road-based river crossings, with a specific focus on east London, and to Silvertown in particular, to address strategic and local needs for cross-river accessibility and to relieve congestion and improve reliability resilience. A number of the national and regional policy documents contain 'criteria' that would be taken into account in the assessment of a new river crossing at Silvertown, while local planning documents also set out some concerns about local impacts.

The transport and socio-economic overview and issues

2.2.32 This section considers firstly the overall economic context and a summary of the socio-economic conditions in east London. It then shows how the development of London has led to a situation where the Blackwall Tunnel serves as a single strategic river crossing, and how this amplifies the problems inherent in its design. It would also identify the existing transport problems at the Blackwall Tunnel and their increasing impact on the London and UK economy. It shows that these problems have been apparent for some time, that they lead to negative effects on London now, and that these effects would only get worse in future, meaning that there is a pressing need to take action.

London is an engine for UK growth

2.2.33 London is a leading global city and the engine of the UK economy, driving productivity and economic growth. It accounts for over 20% of UK GVA

[21] London Borough of Tower Hamlets: Second Local Implementation Plan (LIP2) 2011-2031, May 2011

and 18% of tax revenue to the Exchequer. In the decade preceding the global financial crisis London generated 380,000 net new jobs. Between 2010 and 2020 GLA Economics estimates that it would create a further 315,000 net new jobs[22]. London is Europe's leading centre of financial and business services and is regularly ranked as either number 1 or 2 in the world on a range of competitiveness indices. In economic terms London is the world's leading global city and the tenth largest economy in Europe.

2.2.34 The importance of London (and east London) in the national economy has been recognised by the Secretary of State in the designation of the Silvertown Tunnel as a Nationally Significant Infrastructure Project (NSIP) for the role it would play in supporting the economic development of London and the wider UK economy.[23]

Current east London economy

2.2.35 While central London's output per head is over 70% higher than the UK average[24] and its performance has outpaced the rest of the country, there are still areas with significant economic problems. While GVA per workplace head has grown by 43% in inner London between 2004-2013 it has grown by just 13% in east and north-east outer London and 16% in outer London south. This compares to the average UK figure of 27%. Median wage levels in boroughs such as Lewisham and Havering are below the English average while unemployment rates in outer south-east and north-east boroughs are well above the UK average.

2.2.36 London's population is predicted to grow by two million people over the next two decades, becoming a city of ten million people by 2031. The London Plan[25] considers the strategic issues arising from the scale of growth that London would need to accommodate over the next two decades, and concludes that east London, with its large areas of ex-industrial brownfield land, the focus of the sub-region's Opportunity Areas 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 and south-east sub-region (ESR). The ESR is projected to increase by 650,000 people with

[22] City of London Corporation (2011), London's Competitive Place in the UK and Global Economies; London Development Agency (2010), Destinations 2020 and GLA Economics, (2010), Economics Evidence Base; See for instance, Cushman & Wakefield (various years), European Cities Monitor, PWC, (2010) Cities of Opportunity 4th Edition and GLA Economics, (2010), Economic Evidence Base
[23] Secretary of State for Transport, Silvertown as a Nationally Significant Infrastructure Project, June 2012
24 The Economic Outlook for Central London, Report prepared for the City of London Corporation by Oxford Economics' March 2014
[25] Greater London Authority: The London Plan – Spatial Development Strategy for Greater London, July 2011; Greater London Authority: Draft Further Alterations to the London Plan, January 2014

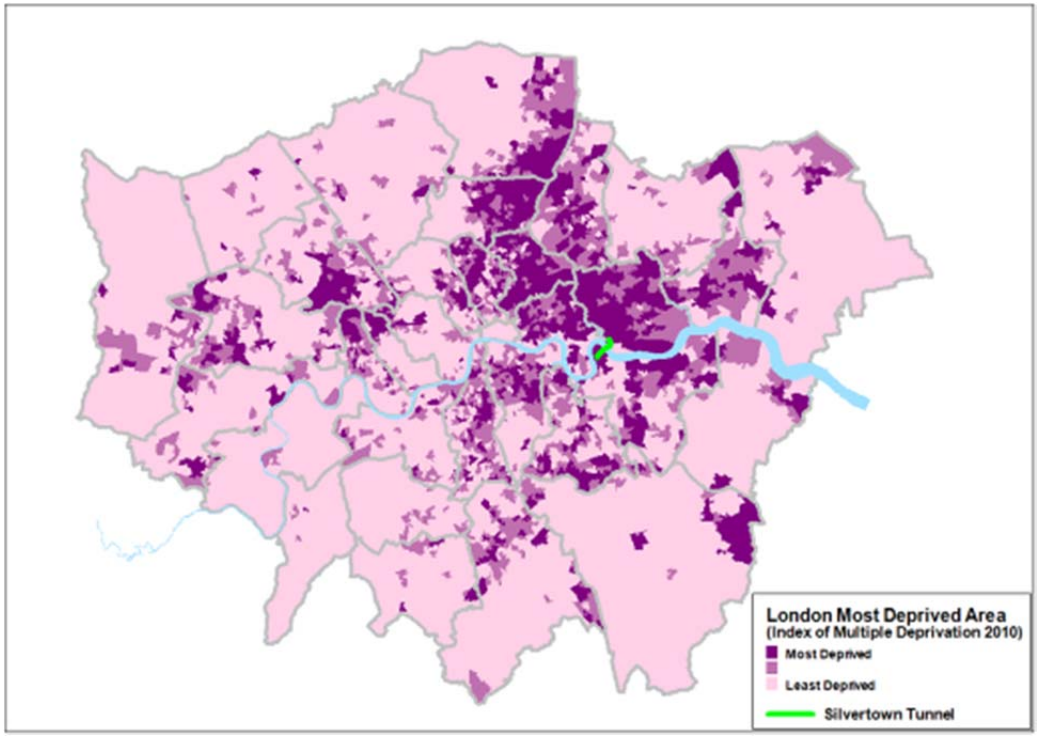
286,000 more jobs by 2036, which is nearly a third of London's projected growth overall. However, it is recognised that achieving this growth is likely to require investment in infrastructure, including road infrastructure and improving cross-river connectivity (paragraph 6.4.1).

2.2.37 Over the last 20 years regeneration has transformed much of the former Docklands and many previously derelict sites now have successful new uses, particularly those in inner London boroughs. This has been facilitated by significant investment in transport infrastructure, both public transport and highways, and has resulted in a diversification of the economic base and a substantial increase in employment in the area. Clusters of specialist activities have emerged. For example, many high value services which traditionally have been confined to central London now have bases in Canary Wharf, while a major concert arena (The O2 Arena) on the Greenwich Peninsula and an international conference centre (ExCeL) at the Royal Victoria Dock have also been established. Most recently, the Olympic Park at Stratford occupies formerly industrial land within the Lea Valley, slightly to the north of the Docklands area but closely linked to it by the River Lea, the A12 and the DLR and Jubilee line.

2.2.38 While significant regeneration has already taken place, London Thames Gateway still remains one of the most deprived areas not only of London but of the whole of the UK as illustrated in Figure 2-2[26].

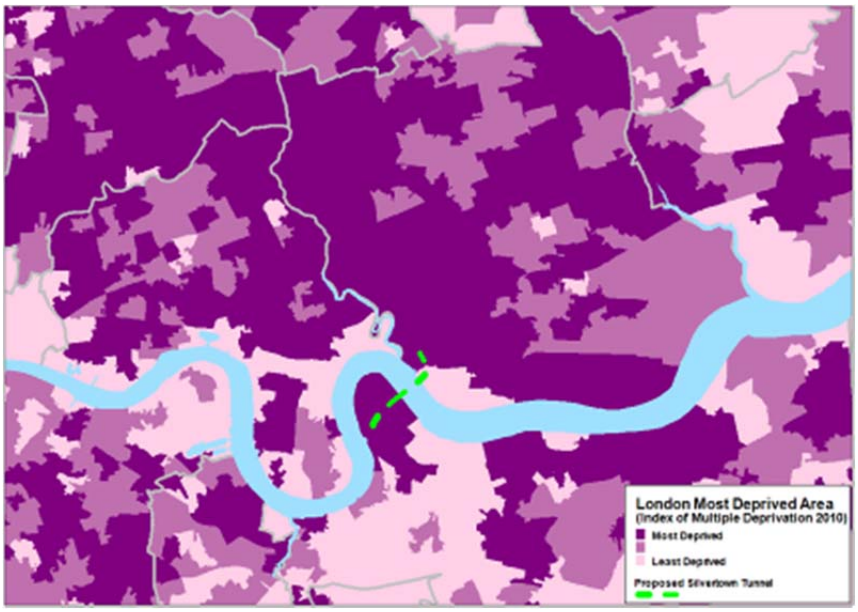
[26] 2.3.2 The London Plan identifies areas of regeneration based on Lower Super Output areas (LSOAs) within the 20% most deprived nationally, as defined by the Index of Multiple Deprivation.

Figure 2-2 London – most deprived areas



2.2.39 The level of local deprivation in relation to the proposed Silvertown Tunnel is shown in Figure 2-3. Reductions in congestion and increases in reliability and improvements in cross-river connectivity offers the potential to increase markets for businesses and access to labour markets thereby improving job opportunities for local people.

Figure 2-3 East London – most deprived areas



The scarcity and type of east London river crossings reflect the development of London

2.2.40 The limited number of east Thames river crossings for highway traffic is in part a legacy of the historic pattern of the Capital's development[27] and partly due to the characteristics of the River Thames - past the Tower of London, the river broadens and deepens – the distance from bank to bank at Woolwich is five times the distance at Putney. Over time high-value growth took place in the central and western parts of the city, while the east became the home for industrial and shipping activities which were of lower economic value and had little need for extensive cross-river infrastructure.

2.2.41 However, the last five decades have seen those lower value industries decline, and the inner eastern sector of London has become a hub of the knowledge economy, a leisure destination, and home to a rapidly growing population. Together with growth in central London, this change has led to increasing demand for travel to and through the former docklands from London and the wider south-east.

2.2.42 The physical and engineering constraints imposed by the River Thames are reflected in the river crossings constructed. In the east, the presence of large, sea-going ships prevented low-level bridges, and the concentration of industry along the river banks led to limited demand for

[27] See for example, Linking London East Thames Crossing Report, Centre for London, 2014

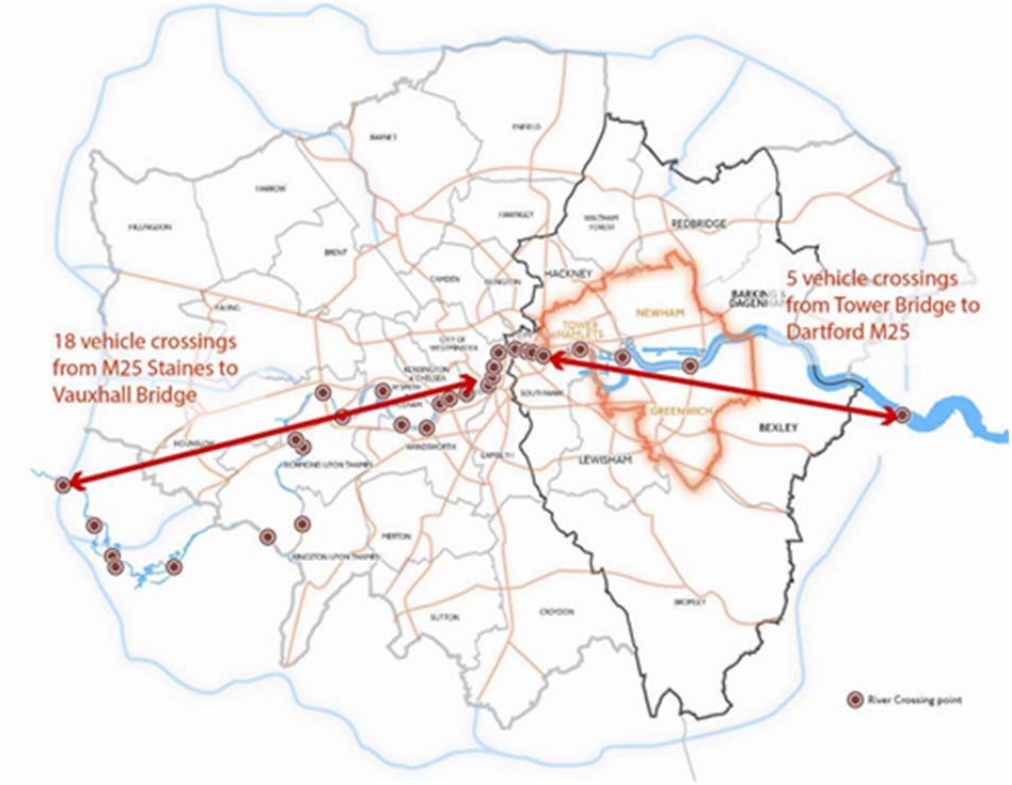
cross river movements. Here the river crossings are old, few in number and low-capacity.

2.2.43 Apart from Tower Bridge (which is a lifting bridge), crossings in the east have been constructed to avoid interference with shipping: the Rotherhithe and Blackwall Tunnels and the Woolwich Ferry. The northbound bore of the Blackwall Tunnel was opened in 1897, and like the Rotherhithe tunnel, was originally for pedestrian and horse-drawn traffic. The opening of a second bore in 1967 was in recognition of the inadequacy of the single tunnel, which had until then served traffic in both directions using a 'tidal flow' system. Ships retain the right of navigation downstream and so future crossings in east London must respond to this.

2.2.44 In west London these constraints are absent. It is relatively easy to construct low-level bridges, these are generally cheaper than tunnels, and as a consequence of demand married with feasibility, these have proliferated. On average in the centre of London, highway crossings of the River Thames are spaced 1km apart, and in west London the average distance is around 2km. In the east, the average is 8km. Yet population and population density between west and east are not dissimilar.

2.2.45 The difference between crossings east and west is illustrated clearly in Figure 2-4. It can be seen that there are 18 crossings in 29 km from Vauxhall Bridge to the M25 (Staines) in West London, but only 5 crossings in 23 km from Tower Bridge to the M25 (Dartford) in east London.

Figure 2-4 Vehicle crossings in east and west London



2.2.46 It is not only users of private vehicles who are disadvantaged by this paucity of road crossings in east London: the provision of bus and coach services is also hindered. In west London there is at least one bus route over all but two of its bridges (the exceptions being Albert and Twickenham bridges).

2.2.47 In east London, the limited number of road crossings acts as a major constraint on the number of cross-river bus services that can be operated. Only the Blackwall Tunnel provides a suitable opportunity for a bus route (the 108) and it can only accommodate single-deck buses owing to its size.

2.2.48 The 108 service is badly affected by the congestion, closures and lack of resilience of the Blackwall Tunnel. These problems undermine the feasibility of running further services through the Tunnel. Of the three remaining crossings to the east of Tower Bridge, the Dartford Crossing is outside the Greater London Authority (GLA) area, and neither the Rotherhithe Tunnel nor the Woolwich Ferry can accommodate buses.

2.2.49 Highway travel is an important component of transport provision in London for both private road users and for public transport in the form of buses and coaches. However, it is only part of the transport story: dedicated public transport links are also important. In contrast to the road network, there has been a period of sustained investment in public

transport capacity across the whole of east London over the past 20 years.

2.2.50 Led by the regeneration of Docklands, seven new rail crossings of the Thames in east London have been implemented, with a further crossing to come in the form of Crossrail. This means that by 2020, there will be almost as many rail crossings to the east of Tower Bridge as to the west of Vauxhall Bridge (Figure 2-5). This investment will have led to almost a tenfold increase in the capacity of the cross river rail network east of Tower Bridge, as shown in Figure 2-6.

Figure 2-5 Cross-river rail services in east and west London

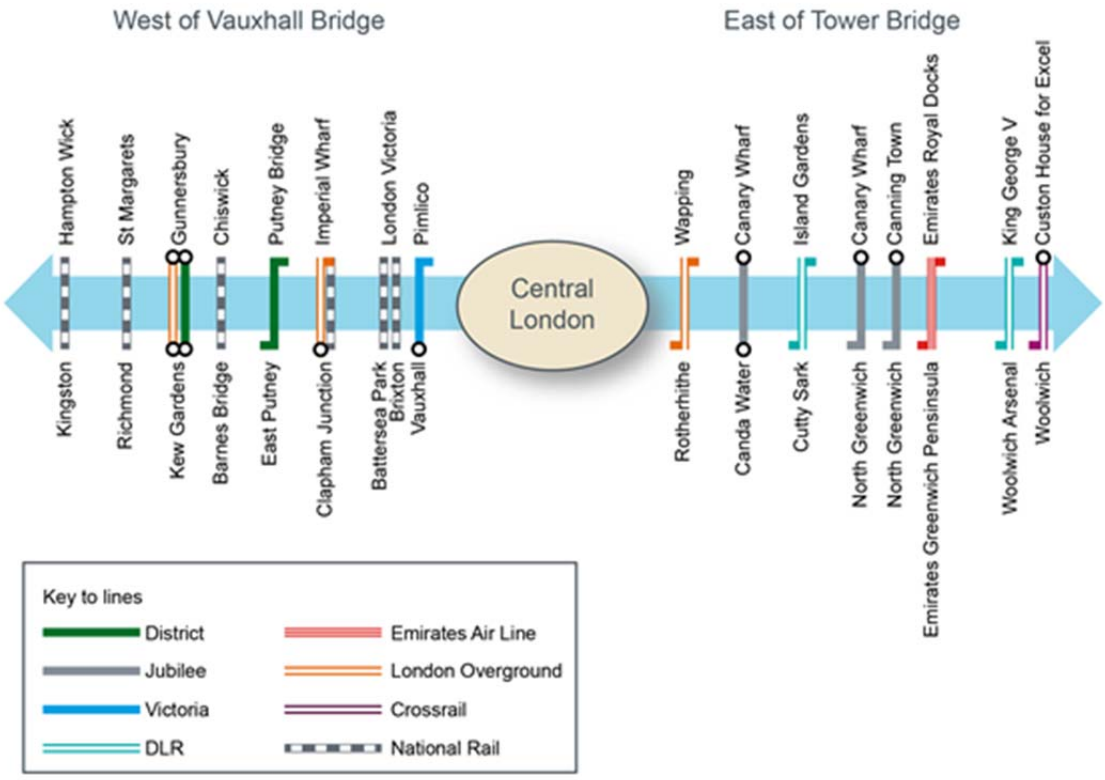
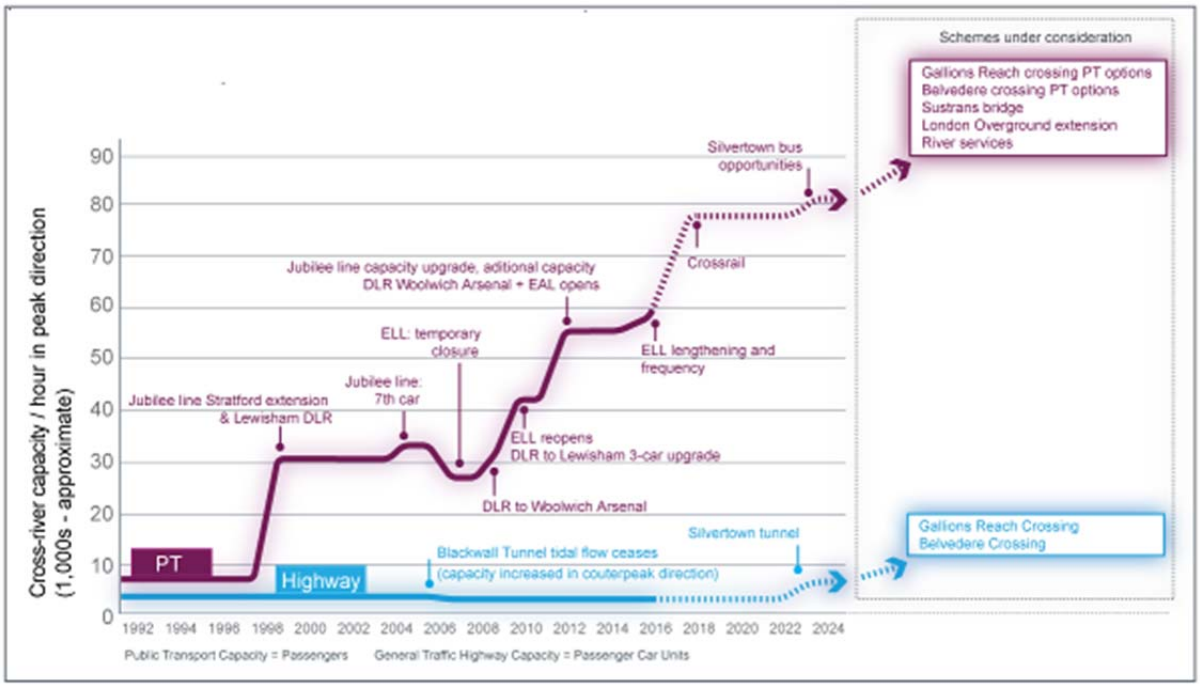
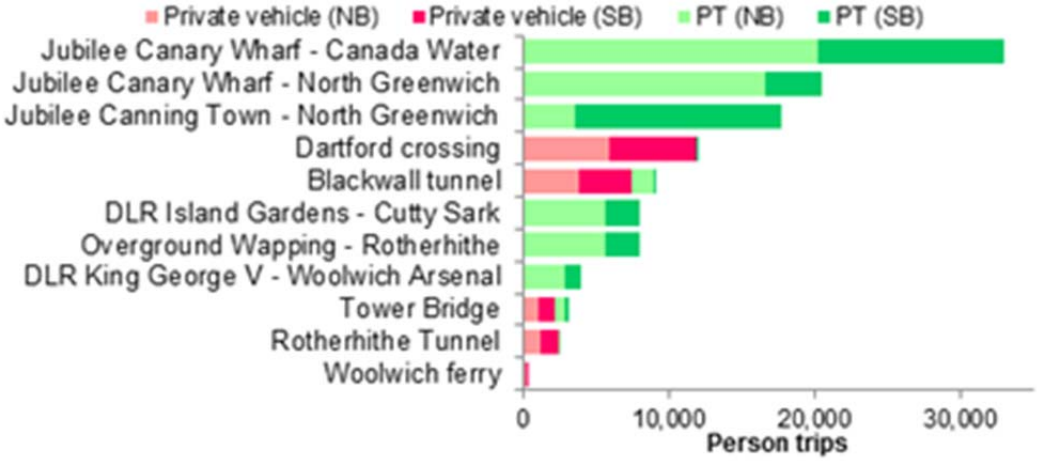


Figure 2-6 Increase in rail capacity east of Tower Bridge



2.2.51 This investment and prioritisation of rail investment has had a direct influence on the patterns of travel that have developed, and as shown in Figure 2-7, public transport use predominates in cross-river travel.

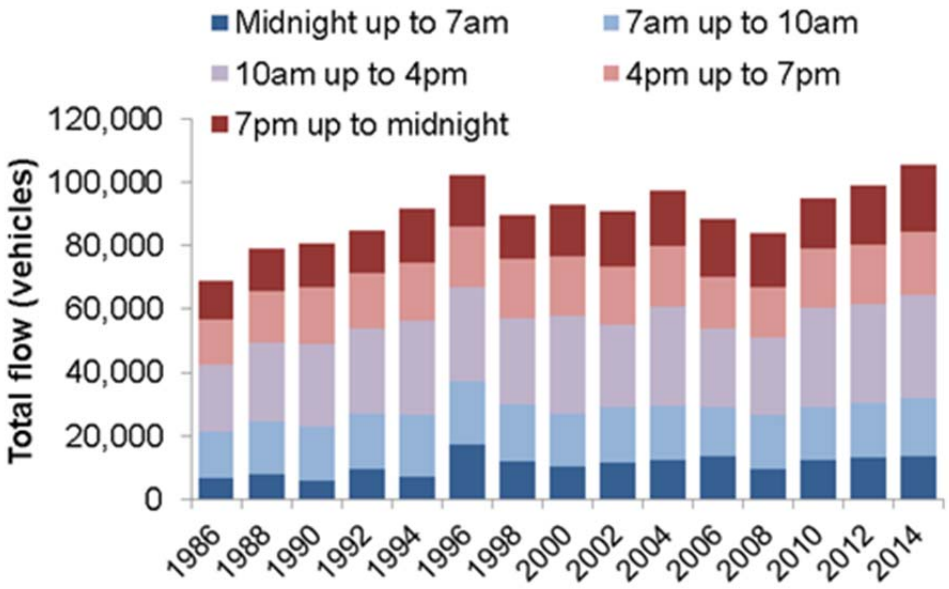
Figure 2-7 AM peak hour (08:00-09:00) cross-river road and PT person trips in east London (2012-13)



2.2.52 However, demand for road crossings has not fallen as a result of the increased public transport provision in the area. There remains a continued need for trips by road, particularly for commercial traffic such as vans and lorries – 90% of all freight in London is carried by road. Not all trips can be shifted to public transport, walking and cycling, and increases to public transport capacity do not automatically lead to reduced vehicle traffic. Figure 2-8 shows that demand at the Blackwall Tunnel was not

affected by the huge increases to rail provision in east London described above.

Figure 2-8 Vehicle flows at the Blackwall Tunnel, 1992-2014



2.2.53 This is confirmed by travel patterns in the area. Travel to work mode shares within the eastern boroughs show that commuting by road, whether by car, van, bus, coach, taxi or motorbike as the main transport mode, is important for many people and accounts for around 40% of all journey to work trips. While there would be increasing opportunity for some mode switching to rail once Crossrail opens, road transport would continue to play a significant role. Table 2.1 also shows how vehicle use is rising due to population and employment growth despite a move to the use of more sustainable modes.

Table 2.1 Changes in study area residents commuting by private vehicle (2001-11)[28]

Resident Borough	2001 car and van use		2011 car and van use		Change in number / mode share
	Number	Mode share (%)	Number	Mode share (%)	
Greenwich	33,500	(39%)	33,900	(30%)	+400 / (-9%)
Newham	25,300	(32%)	27,700	(21%)	+2,400 / (-11%)
Tower Hamlets	13,200	(19%)	14,400	(12%)	+1,200 / (-7%)
Totals	**72,000**		**76,000**		**+4,000 (6%)**

2.2.54 The proportion of residents using a private vehicle to travel to work has reduced between 2001 and 2011 in all three of the Silvertown crossing host boroughs, indicating the impact of considerable investment in rail infrastructure and possibly the level of congestion and unreliability of the road network. However while the share of commuting taking place by private vehicle has fallen, the absolute number of residents commuting by private vehicle has risen in all boroughs, by a total of 6%, as a result of population and employment growth.

2.2.55 Traffic composition is the same in both directions at the Blackwall Tunnel with, 68% cars, 18% vans and small lorries, 8% heavy lorries, motorbikes 3%, taxis and private hire cars 2% and buses/coaches 1%. So more than a quarter of vehicles using the tunnel are business or goods vehicles, and many cars are commuting or business users[29].

The Blackwall Tunnel is east London's strategic highway crossing

2.2.56 In central and west London, there is a closely-spaced series of crossings which are well-connected to the road network. This means that there are genuine alternatives available for many journeys, and provides a good degree of resilience when any one of the crossings is congested, or closed (as Putney Bridge was for three months in late summer 2014).

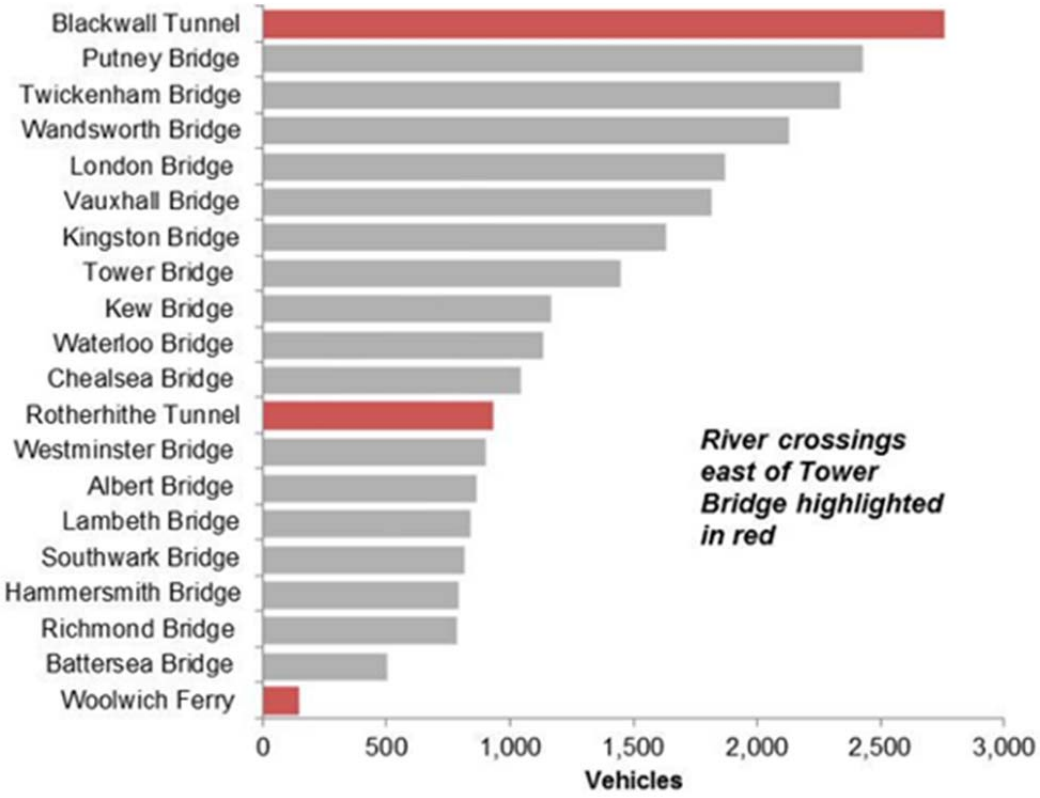
2.2.57 In east London however, the economic, historical, and topographical factors outlined above have led to a very different situation, in which the Blackwall Tunnel has become a single link of pivotal strategic importance in the highway network. The importance of the crossing amplifies the effects of its problems.

[28] Census, 2011
[29] TfL traffic counts, 2012

2.2.58 The importance of the Blackwall Tunnel as a link in the east London road network can be demonstrated by considering its contribution as one of five crossings in the eastern part of the Thames. It can be seen that the Blackwall Tunnel is carrying a disproportionate share of traffic: over 30 per cent of all private highway trips across the eastern Thames in the AM peak hour, the inter peak average hour, and the PM peak hour (if the Dartford Crossing is included in the calculation). If Dartford is excluded, the proportion increases to 60 per cent or more in each period; and this high figure persists despite significant congestion and closures at the Blackwall Tunnel.

2.2.59 In fact, as Figure 2-7 shows, the Blackwall Tunnel not only carries by far the most traffic of the three road crossings in east London (shown in the darker bars), but also carries the most traffic of any of the road crossings in the Capital.

Figure 2-9 Weekday AM peak hour northbound traffic on GLA river crossings (2012)



2.2.60 The Blackwall Tunnel is clearly carrying significant volumes of traffic. In part this reflects its position in the road network, carrying traffic through the heart of the intersection between the A2, A12 and A13 – inner east London's principal roads.

2.2.61 It also reflects the distance from other crossings in the east. The nearest alternative road crossings are the Rotherhithe Tunnel and the Woolwich Ferry, lying 7.5km to the west and 5km to the east respectively. These

crossings do not provide meaningful alternatives to the Blackwall Tunnel because they are principally local links, capacity-constrained, and are not positioned to connect major arterial routes.

2.2.62 These capacity constraints are a consequence of the design of the other east London links. Owing to its relatively narrow and bending shape, heavy goods vehicles are not permitted to use the Rotherhithe Tunnel, and it is unsuitable for buses (certain taller vehicles are not permitted to use the northbound bore of the Blackwall Tunnel either.) The Woolwich Ferry has extremely low capacity (around 200 pcu's per hour in each direction) and is already at capacity in the AM peak.

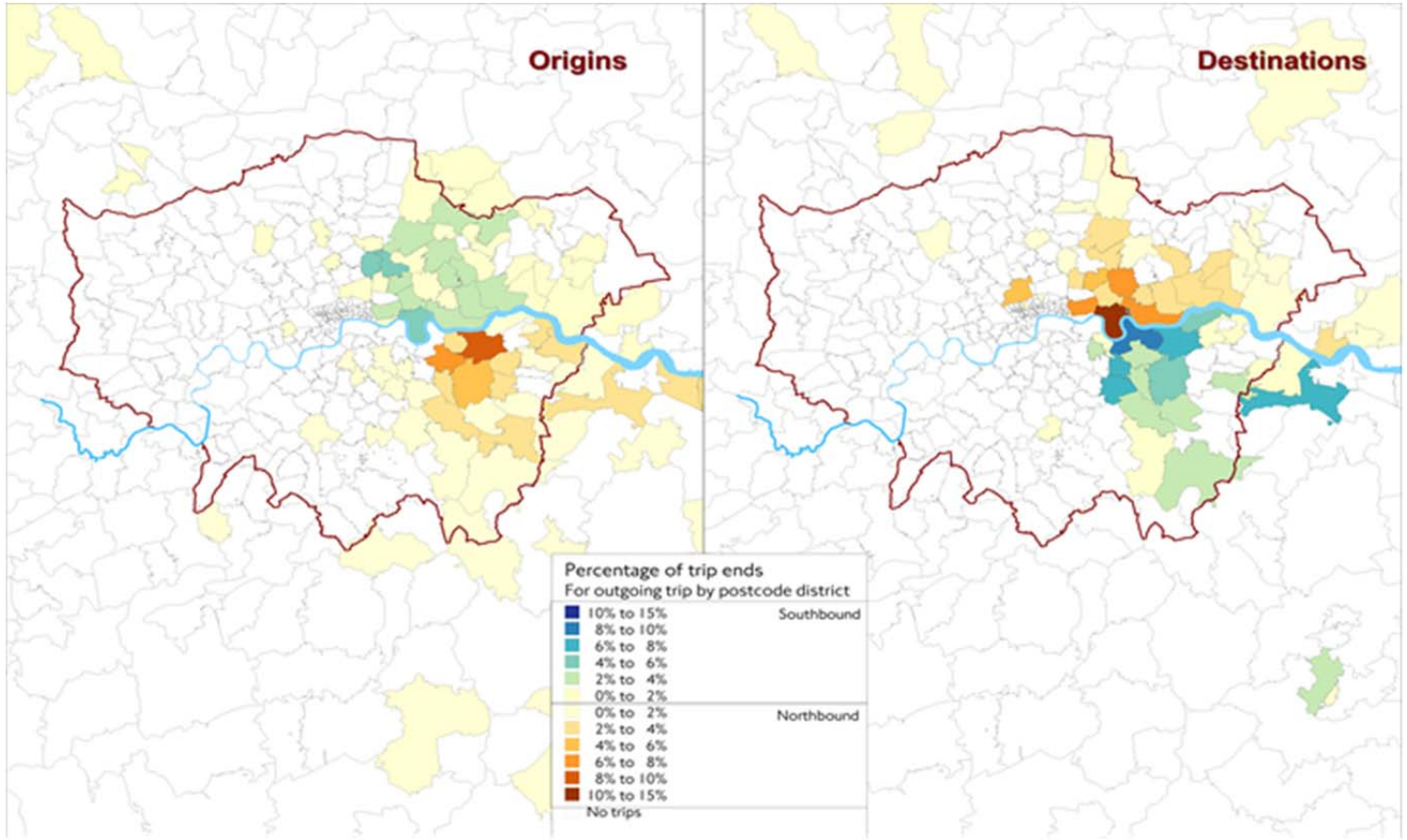
2.2.63 Still further to the west and east of the Blackwall Tunnel respectively are Tower Bridge (some 9km distance) and the Dartford Crossing (some 25km distance, with a user charge).

2.2.64 Using these crossings would mean traffic making longer trips, partly on local roads, adding to journey time. Despite the significant diversion involved in using the Dartford Crossing, (which is a strategic, orbital route outside London), it is sometimes used as an alternative to the Blackwall Tunnel, which highlights the lack of appropriate alternatives within London.

2.2.65 For traffic which has an origin or destination within the east and south-east sub-region of London, a crossing in the vicinity of the Blackwall Tunnel is the preferable route for most drivers. But within that broad area, trip ends are for the most part widely dispersed – notwithstanding a cluster centred on the Isle of Dogs.

2.2.66 As shown in Figure 2-10 around three of every four trips through the Blackwall Tunnel had an origin and or destination in the local area (defined as the boroughs of Barking & Dagenham, Bexley, Greenwich, Havering, Lewisham, Newham and Tower Hamlets).

Figure 2-10 Origins and destinations of AM Peak period Blackwall Tunnel trips (Behavioural Survey 2013)



2.2.67 This evidence demonstrates that the Blackwall Tunnel is east London's primary strategic river crossing for vehicular traffic. It also acts as a major connection for traffic between east London and areas beyond London on the other side of the river, and so by extension operates as part of the strategic road network. Its ability to act as a strategic connection for bus and coach users, who also wish to cross the river at this location, is severely constrained by its design and capacity.

Transport problems at the Blackwall Tunnel have significant impacts

2.2.68 As described above, the Blackwall Tunnel has a unique position in the east London highway network, but is constrained by its capacity, design and the lack of proximate alternative crossings. The proposed Silvertown Tunnel would be alongside the existing tunnel and would share approach roads, and has been developed as a solution to these specific problems.

2.2.69 This section goes on to examine the specific transport problems of the Blackwall Tunnel – congestion, closures and resilience - in more detail. The following text describes why these problems matter in the wider sense and why it is therefore critical to take action. This is based on some of the 'second-order' effects of the transport problems: the economic, environmental and public transport impacts. To a greater degree than the transport problems, these effects are also detrimental to non-users of the Blackwall Tunnel.

2.2.70 In this respect one of the reasons for the designation of the Silvertown Tunnel as an NSIP[30], was 'current congestion at the Blackwall Tunnel is having a direct impact on the strategic road network'.

2.3 Transport problem 1 – congestion

2.3.1 The strategic importance of the Blackwall Tunnel on the road network means it attracts far more traffic than it can accommodate. This is particularly the case for northbound travel in the morning peak (see Figure 2-11) and southbound travel in the evening peak, reflecting the fact that it connects residential areas to the south and south-east with employment and commercial centres to the north and north-east.

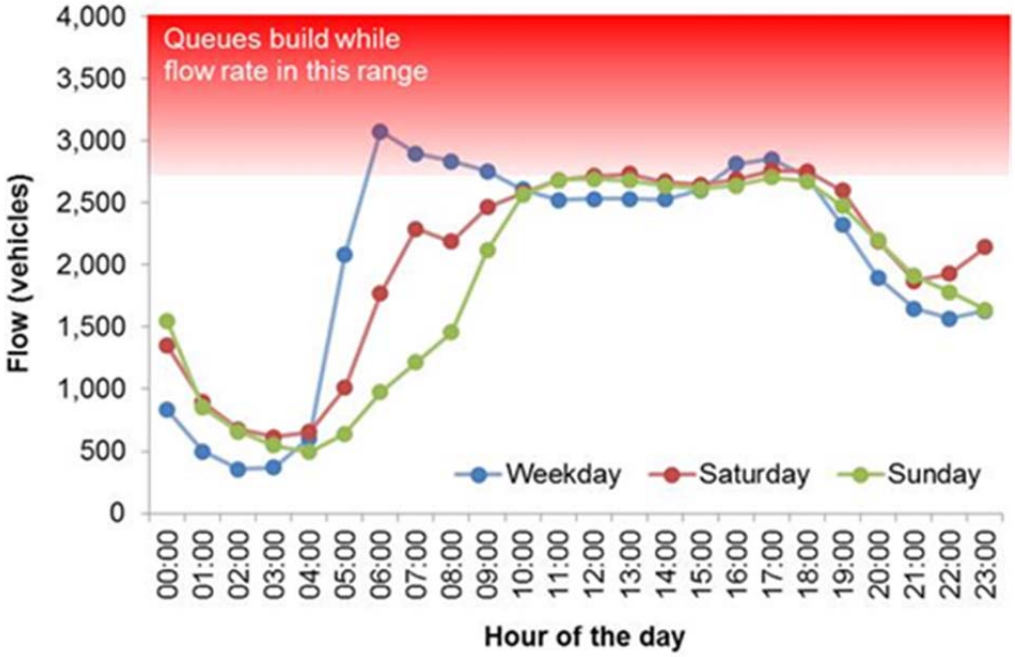
[30] Letter from Justine Greening MP to Boris Johnson, June 2012

Figure 2-11 Traffic on the northbound approach to the Tunnel (view north from Boord Street footbridge, AM peak, 4 June 2015)

2.3.2 Unlike the rest of the A2/A12 corridor which has three lanes in each direction, the A102 (of which the tunnel is part) has only two lanes each way: this leads to congestion. The constraints encountered at the northbound tunnel bore in the morning peak result in a situation where vehicle flows through the tunnel actually fall through the morning peak period as a result of the congested conditions (see Figure 2-12).Traffic which cannot enter the tunnel forms long queues or may divert to other crossings.

2.3.3 This is visible in the extended duration of the peak period at the Blackwall Tunnel compared to most other links on the highway network, as motorists seek to avoid the extremes in congestion which affect the northbound bore from around 6am to around 10am. Even outside the busiest times, demand is close to or exceeds capacity through much of the rest of the day.

Figure 2-12 Blackwall Tunnel northbound - average hourly flows by day type



2.3.4 The result is that traffic on one of London's key strategic road links is routinely subject to significant delay. Sixty-three per cent of local residents who cross the river said that they changed the time of their journey to avoid congestion, and over half (52%) said they sometimes used public transport to avoid driving across the river[31].

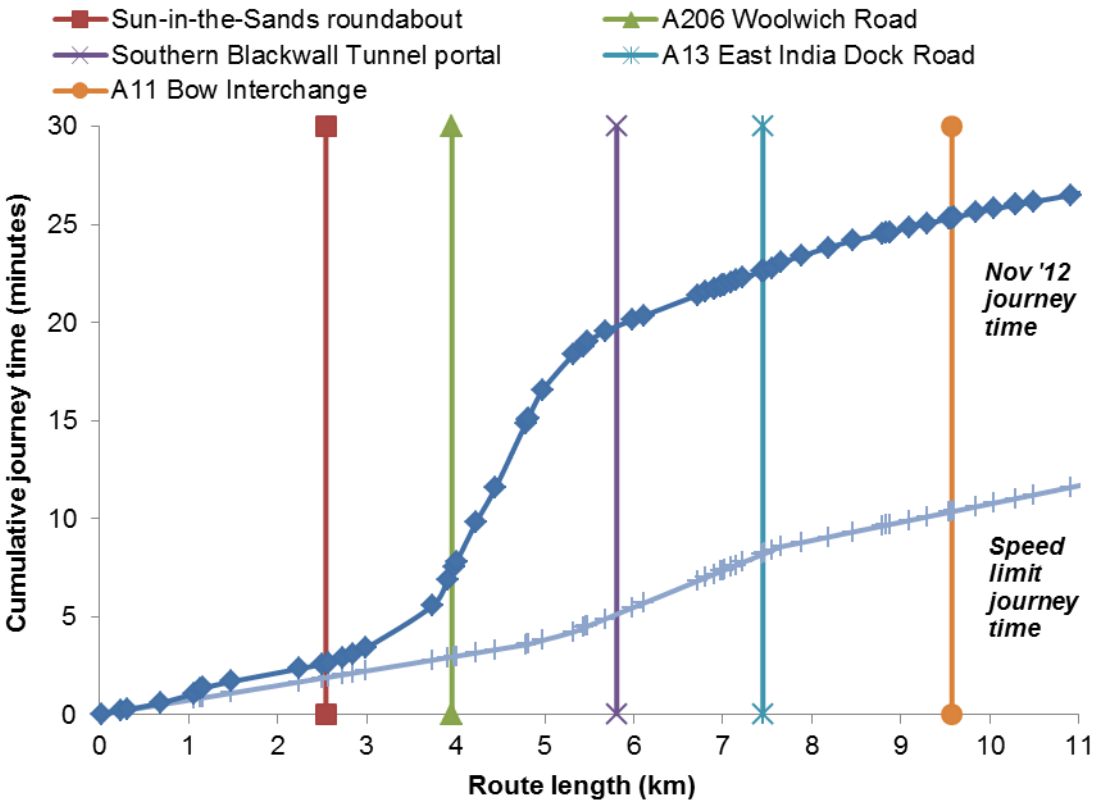
2.3.5 This congestion has a highly detrimental effect on users. For commercial users, the Freight Transport Association (FTA) has calculated that each minute of delay caused by congestion costs the operator £1 a minute; a delay of 20 minutes at the Blackwall Tunnel can therefore add £20.00 to the cost of each individual trip[32]. The FTA also calculated that the additional costs of fuel caused by having to take diversionary routes as 32 pence a kilometre, meaning that a single vehicle diverting from Blackwall Tunnel to Dartford Crossing could face additional fuel costs in the region of £12.50 given the distance involved.

2.3.6 Figure 2-13 identifies where the congestion occurs on a typical northbound journey through the Blackwall Tunnel (from the A205 South Circular via the A2, the A102 and the A12 in Hackney Wick). This is done by comparing the actual journey time with what the journey time would be

[31] River Crossings Residents Survey, Accent Market Research for TfL, 2015
[32] http://www.fta.co.uk/media_and_campaigns/press_releases/2015/20150521_fta_concerned_over_journey_time_reliability_for_road_freight_operators.html

if the journey was made at the applicable speed limit (i.e. was not subject to congestion and delay), and noting where the two sets of data diverge. As can be seen the delay starts to appear at the A206 Woolwich Road and then continues as far as the end of the journey at Bow Interchange. A disparity of around 15 minutes journey time is observed throughout the final 4km section of the route.

Figure 2-13 Observed average weekday AM peak cumulative journey time northbound (Nov 2012) v unconstrained (speed limit) journey time

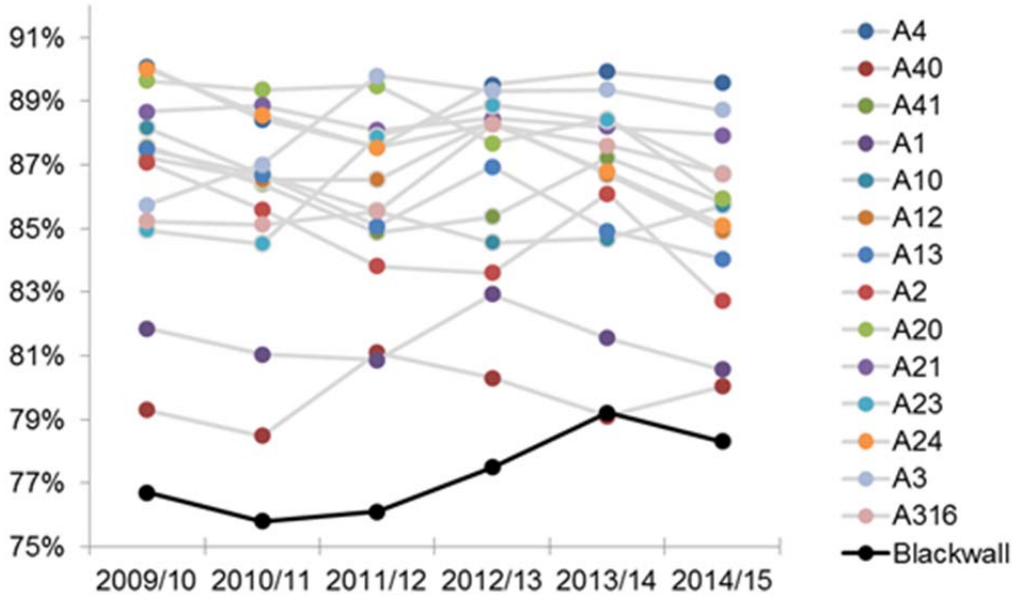


2.3.7 Data from recent surveys of travel behaviour suggests that 63 per cent of local residents who cross the river said that they changed the time of their journey to avoid congestion, and over half (52 per cent) said they sometimes used public transport to avoid driving across the river. Just under half (49 per cent) said they sometimes travelled by a longer route to avoid using the Blackwall Tunnel. This congestion clearly has a highly detrimental effect on users.

2.3.8 Another problem arising from this routine (but nonetheless unpredictable) delay is journey time unreliability. This makes it difficult for users to know what time to set off in order to arrive on time and is likely to be a particular problem for businesses concerned with deliveries and servicing and need to schedule a series of trips throughout the day.

2.3.9 TfL collects data on journey time reliability for the entire Transport for London Road Network (TLRN) and has compared data from the radial corridors on the network with data collected at the Blackwall Tunnel. As shown in Figure 2-14, while it has improved over recent years, the performance of the Blackwall Tunnel has been worse than that of all other any other routes in all but one year, and is significantly poorer than most.

Figure 2-14 AM peak direction journey time reliability (TLRN radial corridors)



2.3.10 Congestion at the Blackwall Tunnel has a far-reaching effect on the wider road network. With around a quarter of all journeys originating outside Greater London, many of the vehicles using the crossing on their way to destinations within London also use the M11 or the A2. Owing to congestion, traffic will sometimes divert to other crossings which has a detrimental effect at the Dartford Crossing and the M25, both part of the strategic road network. The problem does not only affect drivers. Passengers in buses and coaches are subject to journey time delay and unreliability. For bus users, there is a further knock-on effect as the congestion even affects the journey time of buses which terminate at North Greenwich (and do not cross the river) owing to the wider network effects.

2.4 Transport problem 2 – closures and incidents

2.4.1 The design of the northbound bore of the Blackwall Tunnel, while suitable for the Victorian age in which it was built, acts as a serious constraint today. It does not meet modern tunnel design standards for size, safety or curvature.

2.4.2 Its narrowness means that vehicles over 4m (in the left-hand lane) and 2.8m (in the right) cannot be accommodated, which rules out larger lorries and double-deck buses (see Figure 2-15). A 2m width restriction also applies. Both the north- and southbound bores are subject to Category E load restrictions, which is the most restrictive category. The Rotherhithe Tunnel (built a decade later in 1908) also has restrictions.

Figure 2-15 Blackwall Tunnel northbound bore height restrictions

2.4.3 However, unsuitable vehicles nevertheless continue to attempt to use the Blackwall Tunnel, and even those vehicles which are suitable for the tunnel still experience an outdated and far from optimal link. As a consequence, the northbound bore of the crossing suffers an abnormally high rate of incidents, including collisions, shedding of debris, and, most frequently, the attempted use of the tunnel by vehicles which are too tall to use it. In 2013 there was an average of six incidents per day. For around 60 per cent of incidents, the nature of the problem means that TfL has to close the tunnel in order to fully resolve it, which given the very high number of incidents, means frequent closures as shown in

2.4.4 Table 2.2. There were 1,234 incidents causing tunnel closures in 2013, around half of which were due to overheight vehicles. TfL has taken steps to reduce these incidents, but the fundamental design issues cannot readily be addressed.

2.4.5 Most closures are very brief (the average time for the northbound tunnel is just over four minutes), but because the volume of traffic is so high and exceeds the capacity of the tunnel for long periods of the day, even short closures can have significant and extended impacts. They also add to the difficulty of accurately predicting the length of time a journey will take for both bus passengers and private vehicle users alike.

Table 2.2 Closures of northbound tunnel in 2013

Type of incident resulting in closure	Number		% of total	
	N/b	S/b	N/b	S/b
Over height vehicle	618	0	50%	0%
Broken down vehicle	225	143	18%	12%
Road traffic incident	30	21	2%	2%
Other (pedestrians, debris, etc.)	85	112	7%	9%
Total	**958**	**276**	**100%**	

2.4.6 Occasional serious incidents such as accidents can lead to lengthier closures, in which case these impacts are greatly amplified. The effects of this are considered further in the next section.

2.4.7 The business survey found that predictability of journey times is considered to be poor (63%). Amongst the firms that experience major and moderate disruption, the main consequence is being late for meetings/appointments (41%). The survey found that around half of businesses would be likely to operate cross-river more often if crossings in the Blackwall Tunnel / Silvertown area were made more reliable in terms of consistent journey times.

2.4.8 TfL has also compared the closure rate of the Blackwall Tunnel with similar tunnels in the UK, both in terms of absolute number of closures and using a calculation which produces the number of vehicle km travelled per year in each tunnel[33]. On both measures, the Blackwall Tunnel is clearly prone to a much higher number of closures, almost four times that of the other tunnels with some 25.3 unplanned closures occurring for every million kilometres travelled.

2.4.9 So far, the Blackwall Tunnel has not been subject to an extended closure – weeks or months rather than the few minutes per closure described here. It is likely that at some point in the future a longer closure would be required, if not for maintenance then as a result of an incident, since despite best efforts, this remains a possibility in an ageing tunnel.

[33] Tunnels compared: Limehouse Link, Rotherhithe Tunnel,Tyne Tunnels, Mersey Tunnels (2014/15). See Appendix D of the Preliminary Transport Assessment

2.5 Transport problem 3 – lack of network resilience

2.5.1 Continuing high levels of demand and delay, and the susceptibility of the Blackwall Tunnel to closures expose a third distinct problem – a lack of resilience in the road network in the area of the tunnel. In a transport context the term ‘resilience’ describes the ability of transport networks to provide and maintain an acceptable level of service in the face of both planned and unplanned incidents.

2.5.2 This lack of resilience becomes most apparent in the event of closures which encourage significant numbers of vehicles to seek alternative routes. As we have seen, genuine alternative routes close to the Blackwall Tunnel simply do not exist, given the constraints at the nearest crossings of Rotherhithe and the Woolwich Ferry.

2.5.3 As a result, many have few viable options but to divert to the Dartford Crossing, which forms part of the M25 London Orbital Motorway. Since the Dartford Crossing does not have the capacity to accommodate such additional volumes of traffic, this can result in serious congestion on the M25, one of the UK’s key strategic roads, and on roads crossing the M25 in north Kent and south Essex (including the principal freight route between the Channel ports and the North of England).

2.5.4 In these circumstances the strategic significance of the Blackwall Tunnel becomes plain. Currently, most of the closures last for less than 15 minutes and queues build up as drivers wait for the reopening (although some would divert to other crossings if they have sufficient warning). Drivers continue to use the Blackwall Tunnel owing to the lack of alternative crossings, and continue to endure delays and congestion.

2.5.5 The four principal alternative routes for traffic are shown in Figure 2-16. The shorter routes, via Tower Bridge, the Rotherhithe Tunnel and the Woolwich Ferry, are unsuited to substantial additional volumes of traffic. Hence traffic diverts to the longer route taking in the A2, Dartford Crossing and A13 but even that would be overloaded with an additional 2,000 plus vehicles an hour should there be a significant incident at Blackwall.

Figure 2-16 Alternative cross-river routes to the Blackwall Tunnel

2.5.6 Table 2.3 provides a summary of each alternative route shown in the figure above, in comparison to the Blackwall Tunnel route.

Table 2.3 Blackwall Tunnel and alternative routes

Route via. (see Figure 2.16).	North bound	South bound
Tower Bridge	6km	10km
Rotherhithe Tunnel	3.5km	8km
Woolwich Ferry	7km	6km
Dartford Crossing	26km	26km

2.5.7 Both the map and table illustrate well that there are no practical and realistic alternatives for the majority of cross-river trips using the Blackwall Tunnel at the current level of demand should the tunnel be closed for a significant length of time.

2.5.8 In addition, for certain categories of commercial road user, the number of highway river crossings available east of Tower Bridge is even more limited by virtue of restrictions on the weights, heights, lengths and/or widths of vehicles that may use them. These restrictions are shown in Table 2.4.

Table 2.4 Restrictions for commercial vehicles using east London river crossings

Crossing	Maximum height	Maximum width	Maximum length

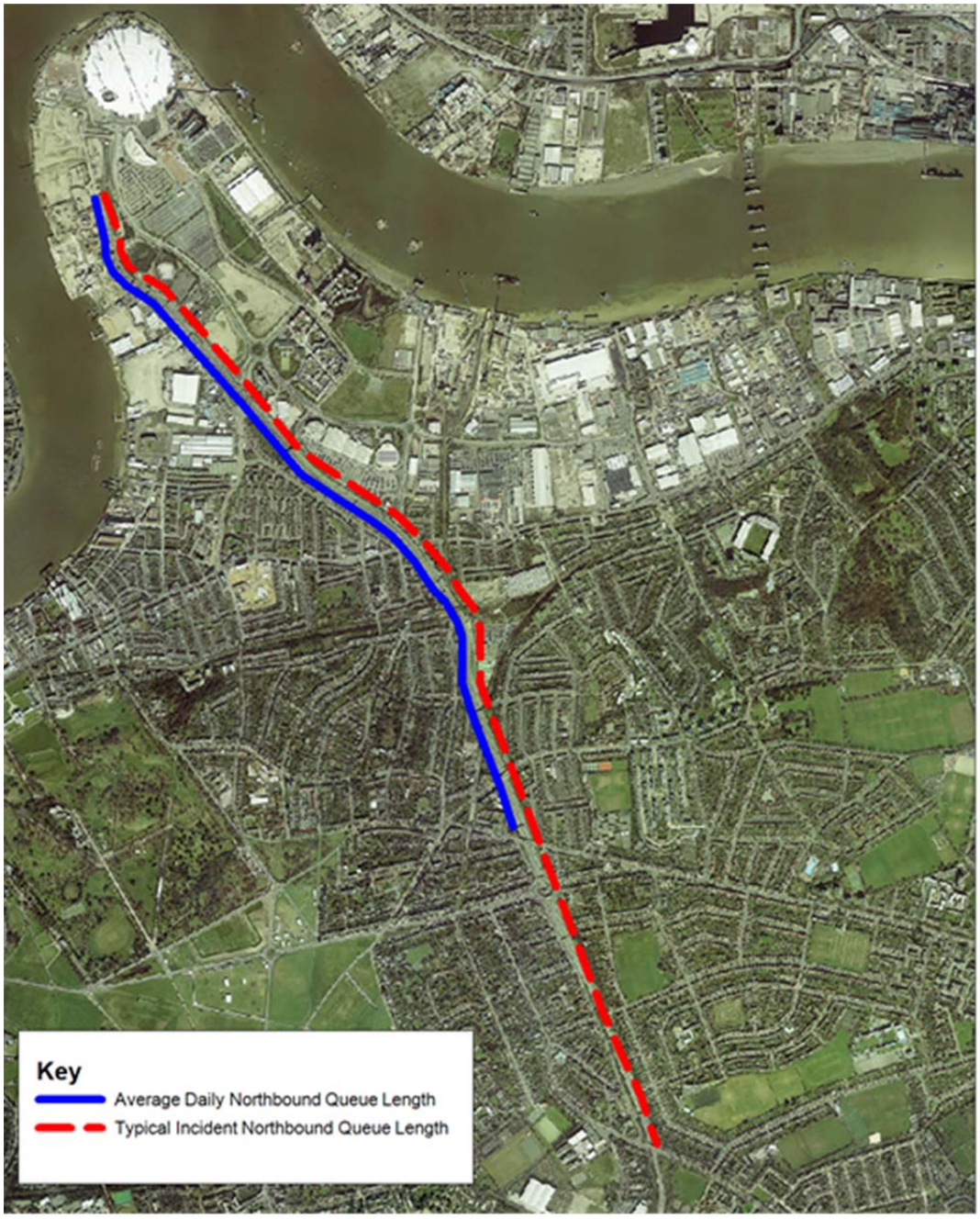
Crossing	Maximum height	Maximum width	Maximum length
Rotherhithe	4.4m	2.0m	10.0m
Blackwall NB	4.0m lane 1/ 2.8m lane 2	None (3.2m lane 1/ 2.24m lane 2)	None
Blackwall SB	4.7m	None (2 no. 3 m lanes)	None
Woolwich F.	4.8 m	3.5 m	None

2.5.9 An implication of these restrictions is that vehicles which are not permitted to use certain crossings may need to take very lengthy diversionary routes, possibly on inappropriate roads, in order to cross the Thames. In this respect, the Woolwich Ferry affords a river crossing opportunity for vehicles which would be barred from using the Blackwall, Rotherhithe, and indeed the Dartford tunnels.

2.5.10 A further consideration for some heavy goods vehicles – those weighing over 18 tonnes – is the London Lorry Control Scheme, which restricts the roads that may be used at night-time and from Saturday lunchtime to Monday morning. During controlled hours, the Blackwall Tunnel is the only permitted river crossing between Richmond and Dartford (a crow-fly distance of around 22 km).

2.5.11 Currently, most of the closures last for less than 15 minutes and queues build up as drivers wait for the reopening (see Figure 2-17). While some drivers will divert to other crossings if they have sufficient warning, many spend time in queues, and bus services also are impacted. Drivers continue to use the Blackwall Tunnel owing to the lack of alternative crossings, and continue to endure delays and congestion. The example in Figure 2-17 shows the resulting queue when a broken down vehicle caused a tunnel closure of six minutes in the AM peak on a typical weekday.

Figure 2-17 Typical weekday morning peak queues northbound on a normal day and when there is an incident



2.6 Transport problems at the Blackwall Tunnel have significant impacts

2.6.1 The three transport problems of the Blackwall Tunnel are a problem now and will, in the context of growth, become an even more pressing issue in future. It is also important to understand why these problems matter in the wider sense and why it is therefore necessary to take action to resolve them. To do this, some of the 'second-order' effects of the transport

problems need to be considered: the economic, environmental and public transport impacts. To a greater degree than the transport problems, these efects are also detrimental to non-users of the Blackwall Tunnel.

2.6.2 The section 35 direction which designates the Silvertown Tunnel Scheme as an NSIP recognises the interaction of transport and economic growth. It gives four reasons for the designation, the first three of which are:

1. London as an engine of economic growth nationally; and
2. The projected growth of London
3. Current congestion at the Blackwall tunnel is having a direct impact on the strategic road network.

2.6.3 In expansion of the second point the text reads:

"Current infrastructure is likely to be unable to absorb this additional capacity, leading to even greater congestion. Given the position of London as an economic driver nationally any decrease in efficiency in London's transport network may have a consequential detrimental impact nationally. The proposed development [the Silvertown tunnel scheme] is in part intended to address that congestion."

2.7 Effects in the economy

2.7.1 The three transport problems of congestion, closures and a lack of resilience described above translate into secondary effects on the economy. To understand the range and significance of these economic effects this section describes how businesses rely on the Blackwall Tunnel to operate effectively. It then describes the significance of the transport problems and how these translate into impacts on business operations, and investigates whether these problems are acting as a disincentive to further investment in east London.

2.7.2 First, it is known that much of the current use in business hours is for work or commuting purposes. Nearly 45 per cent of all trips through the Blackwall Tunnel in 2013 were commuters, with a further 25 per cent travelling for other work purposes[34]. The Blackwall Tunnel therefore provides an important means for businesses to access their labour market, and for individuals to access jobs.

[34] Behavioural Survey recruited at roadside, TfL, 2012

2.7.3 The Blackwall Tunnel is also a key route for goods vehicles, with businesses using it to deliver goods and services to customers and clients, as well as receiving deliveries to support business operations. It carries the most LGVs of all the eastern crossings, at over 500/hour in the AM peak, northbound. These trips are fundamental to the efficient functioning of the London economy – 85% of all freight traffic is carried by road, with LGV movements expected to grow by 30% between 2008 and 2031[35]. Goods vehicle trips are also very difficult to switch to other modes, so demand at major strategic links like the Blackwall Tunnel is very likely to remain high. .

2.7.4 The importance of the Blackwall Tunnel as a strategic link for businesses is also supported by the views of businesses themselves. A survey of 500 businesses was undertaken during Summer 2015 to identify the extent of their markets, their suppliers, their growth expectations and specific constraints to their operations[36]. Interviews were with businesses based in the London Boroughs of Southwark, Lewisham, Bexley, Tower Hamlets, Newham and Barking & Dagenham, as well as the Royal Borough of Greenwich. The survey results show that the Blackwall Tunnel is viewed as the most important cross river link in East London, by half (52%) of businesses, followed by Dartford (24%) and Tower Bridge (14%).

2.7.5 Given the importance of the Blackwall Tunnel as the most important cross river link for businesses in East London, high levels of congestion therefore impact on a wide range of businesses. Three quarters (74%) of all businesses surveyed said that daily congestion at the Blackwall Tunnel is a disruption or constraint to their business. This is time which could be better spent on productive activities, rather than sitting in traffic.

2.7.6 The Freight Transport Association (FTA) has calculated that each minute of delay caused by congestion costs the operator £1; on this basis a delay of 20 minutes at the Blackwall Tunnel could add £20 to the cost of each individual vehicle's trip[37].

2.7.7 Whilst everyday levels of congestion impose predictable costs on businesses, poor journey time reliability through closures and incidents also pose significant additional problems for businesses which result in further costs. Nearly two thirds (62%) of businesses think that journey time predictability at the Blackwall Tunnel is poor. This makes it difficult for

[35] Mayors Transport Strategy 2010
[36] Silvertown Tunnel Business Survey 2013-2015, WSP
[37] FTA concerned over journey time reliability for road freight operators Press release May 21, 2015

businesses to plan their operations with certainty and results in a range of inefficiencies including:

- Businesses build in extra time to allow for uncertainty when crossing the River Thames (32% of all businesses surveyed);
- Businesses miss time critical deliveries which let down their customers and can effect future business opportunities (33%);
- Staff are often late for meetings with customers when crossing the River Thames, which again has an impact on future opportunities (40%);
- Staff are often late for work (30% say staff are late at least once a week, with the average cost of this estimated to be £26,000, which is enough to employ an additional member of staff)

2.7.8 By reducing congestion and improving journey time reliability, businesses would have more certainty over their route planning, have more control over their costs and be able to pursue potential opportunities more effectively. Just over half of all businesses in east London reported that their business would be more likely to operate cross-river if journey times were made more reliable.

2.7.9 Poor levels of resilience and the lack of alternative routes also result in additional costs through additional staff time and fuel. Additionally, when disruption at the Blackwall Tunnel leads to significant rerouting to the Dartford Crossing, congestion can affect commercial road users across the south-east of England, and impede regional, national and even international movements of goods.

2.7.10 Taken together, high levels of congestion, poor reliability and resilience at the Blackwall Tunnel therefore impose significant costs on the large number of businesses that rely on the ability to cross the River Thames, with costs much higher than should otherwise be the case if the road network was functioning efficiently. These increased costs effectively result in a ‘barrier effect’ where the movement across the River Thames is seen as a constraint to the ability to access customers, suppliers, staff and jobs on the other side of the River.

2.7.11 This ‘barrier effect’ is clearly apparent in terms of the distribution of the labour market in East London. Figure 2-18 shows the labour catchment area of part of Richmond (outlined in green) located south of the river. It can be seen that the River is no real barrier and has minimal impact on travel to work patterns.

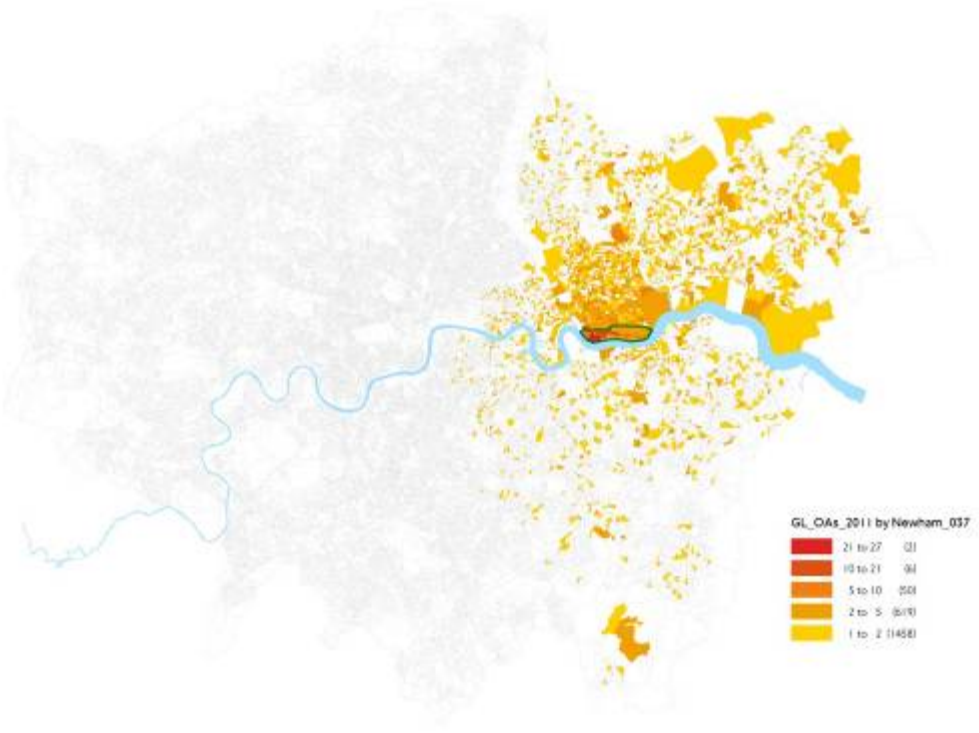
Figure 2-18 Place of residence of those working in Richmond

Source: Nomis

2.7.12 A rather different picture emerges when looking at the labour market catchment of the Royal Docks in the London Borough of Newham as illustrated in Figure 2-19, where there are very few people travelling from south of the River. It is clear that it is a major barrier both to people seeking work and employers trying to recruit. The business survey identified that 60% of those taking on staff had recruited more than 75% of them from the same side of the river and over 40% had recruited no-one from the other side.

2.7.13 Given the amount of potential employment growth that can be accommodated in East London, this is a major barrier to facilitating access to job opportunities for residents south of the river.

Figure 2-19 Place of residence of those working in Royal Docks Newham



Source: Nomis

2.7.14 This 'barrier effect' is also evident in terms of access to customers. 26% of all businesses surveyed believe that the problems at the Blackwall Tunnel have reduced the size of their potential customer base.

2.7.15 The net result of high levels of congestion, poor journey time reliability, poor resilience and a 'barrier effect' of the River Thames affects the efficient operation of the economy of East London and its ability to fulfil its true potential. Addressing these issues is likely to enhance competition and improve business efficiency and profitability, which in turn is likely to lead to more investment and job creation. This is supported by the strong consensus amongst businesses surveyed that current crossing options are not adequate (68%), and that four in ten businesses feel that the current number and capacity of river crossings in east London act as a barrier to the development of their operations across the other side of the River. This rises to 49% in the London Borough of Tower Hamlets and Royal Borough of Greenwich and to 53% amongst respondents with £1m turnover or more.

2.7.16 Evidence that businesses have chosen not to locate in a given area is almost by definition difficult to find. However there is an example of this in

the case of the relocations of businesses from what is now the Queen Elizabeth Olympic Park ahead of the London 2012 Games. The majority of these businesses did not choose new premises south of the River Thames, with many preferring to locate much further from their original Stratford home in outer east London and even in Essex. The barrier effect of the Thames seems likely to have been a factor in these relocation decisions.

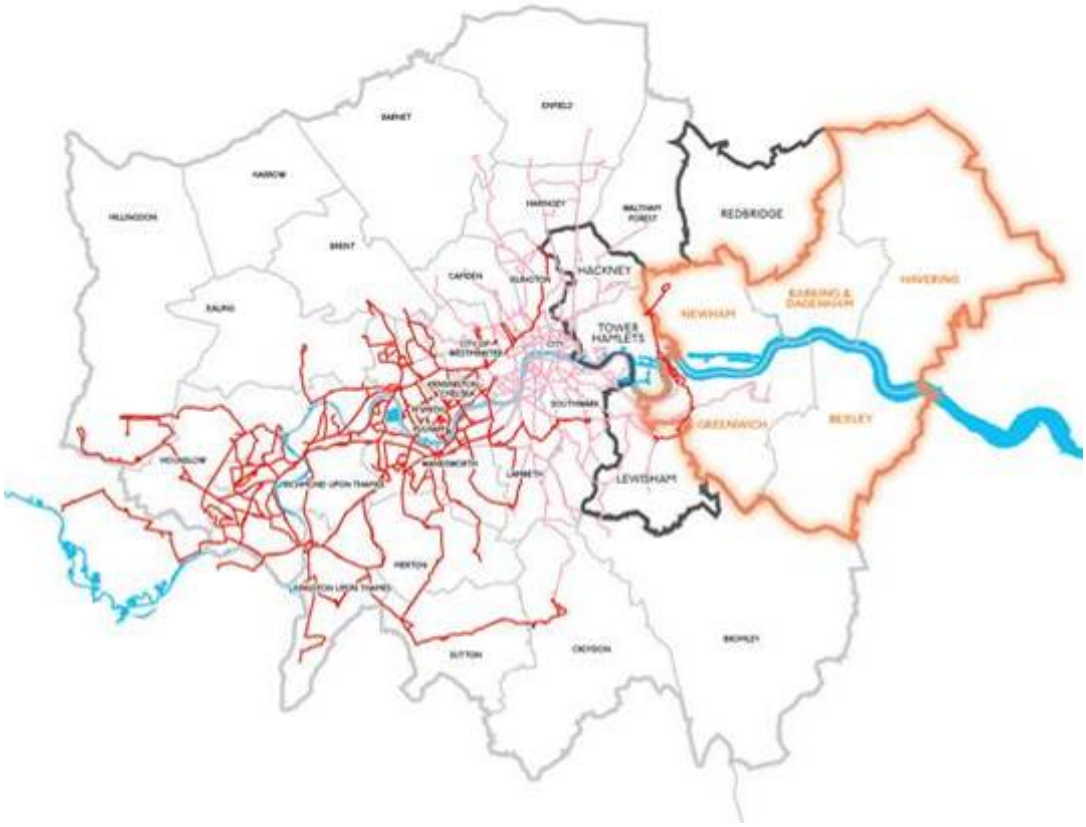
2.7.17 The transport problems and their detrimental impact on the local economy described here are already being experienced by businesses across east London. In the context of continued population and employment growth, there is likely to be a compounding effect whereby escalating transport demand puts further strain on the Blackwall Tunnel (resulting in even more congestion and delay) and the economic effects of these problems are felt even more acutely, ultimately serving to impede rather than support forecast growth.

2.8 Effects on public transport

2.8.1 The problems of the Blackwall Tunnel do not affect only private cars and commercial traffic: public transport users (and potential users) are also adversely affected by delays, congestion and journey time unreliability. There is one bus route through the tunnel, running 24-hours per day at a frequency of 7-10 minutes in the daytime. Additionally, some 90 commuter coaches from Kent also use the northbound route in the morning peak. On this measure, approaching one in five of the current users of the Blackwall Tunnel in the AM peak are public transport users.

2.8.2 Figure 2-20 highlights the extreme disparity in cross-river bus services operating between east and west London. There are 47 bus routes which cross the river west of Vauxhall Bridge and only a single route crossing the river east of Tower Bridge – the 108 between Stratford and Lewisham via the Blackwall Tunnel.

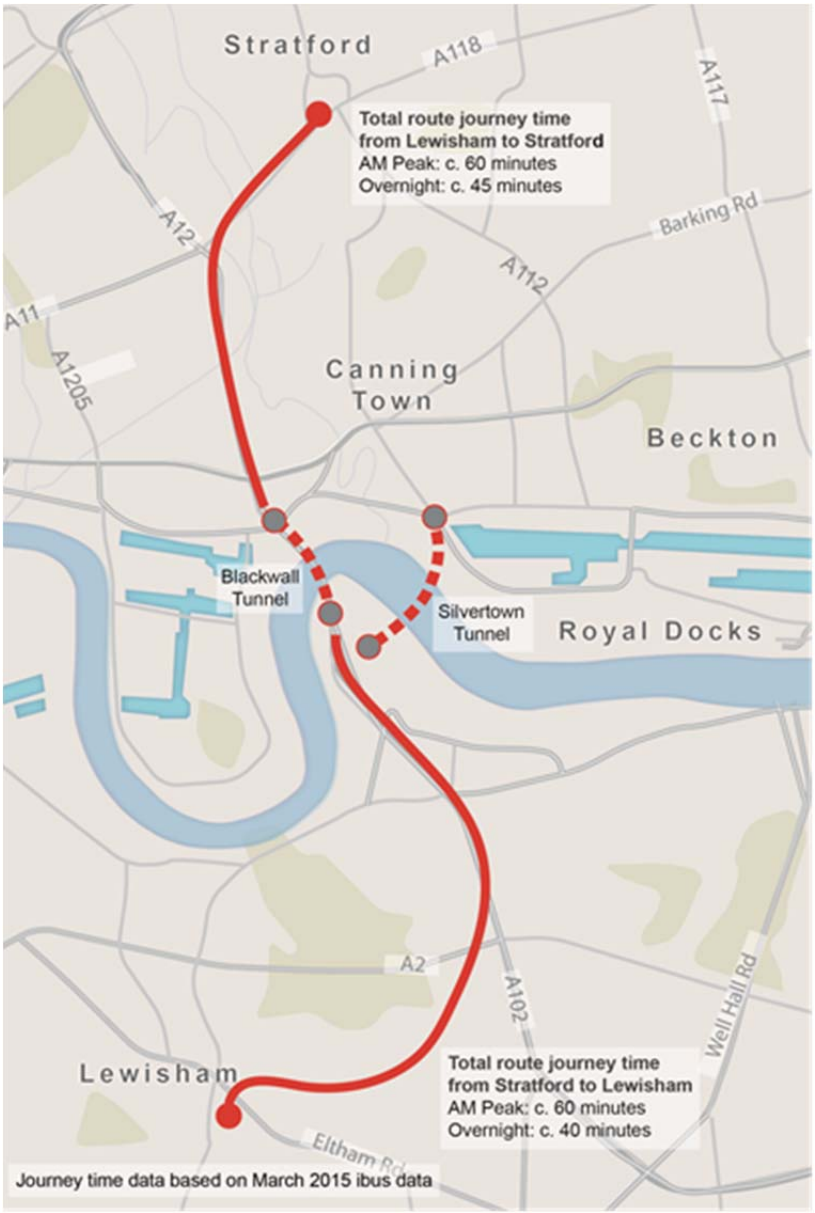
Figure 2-20 Cross-river bus services in London



2.8.3 Users of the 108 bus route routinely experience delay caused by congestion, and disruption owing to tunnel closures which cause delays to passenger journeys and increase the cost of operating the service TfL measures reliability for high-frequency bus routes (five buses per hour or higher) based on the time waited by passengers at stops in excess of the average scheduled wait time. This is known as the excess wait time (EWT) and is measured in minutes. EWT on the route 108 for the period from 3 July 2013 to 2 July 2014 was 1.21 minutes, which was 25% longer than the average EWT for all high frequency bus routes in RB Greenwich and LB Newham for the same period. This figure is an annual average and EWT during the peak periods would be higher.

2.8.4 Overall journey times in the peaks are affected by day to day congestion as well as incident related congestion. Figure 2-21 shows the journey time difference of Route 108 in the AM peak compared to more free-flowing conditions between 22:00 and 23:00. The northbound end-to-end journey takes an additional 20 minutes in the AM peak compared to the late evening and the southbound journey an additional 15 minutes.

Figure 2-21 Route 108 journey time



2.8.5 Under present conditions, a journey across the river by bus is not a realistic proposition for many prospective passengers. It may also act as a deterrent to bus usage even for routes which do not actually cross the river.

2.8.6 The experience of the traffic constraints affecting this bus service, together with the Tunnel's low headroom which prevents the operation of double-deck vehicles, undermine TfL's ability to provide further bus services across the river in this location. Consultation respondents have indicated that additional cross-river bus services would be an important element of any new river crossing and it is likely that there is significant unmet demand for these services.

2.8.7 The congestion effects of tunnel closures are also experienced by bus services which do not cross the river. Some bus services terminating at North Greenwich bus station experience a consequential drop in average speeds, delay and excess journey time as a result of closures of the crossing leading to traffic congestion on the approach roads.

2.8.8 TfL has looked at the performance of one such route - the 132 - on occasions where congestion has built up owing to closures of the Blackwall Tunnel. On 16 January 2014, for example, a 34 minute closure in the AM peak led to bus speeds on this route reducing to almost half their usual average over the course of the day, with a much more significant decrease (to around 5mph) in the period immediately following the closure.

2.8.9 Commuter coach services to and from Kent have long been users of the Blackwall Tunnel, and those using them are subject to the same problems as bus users.

2.8.10 Operators report that it is becoming more difficult to run reliable timetabled peak-hour services, since the variability of delay at the Blackwall Tunnel is high.

2.8.11 Services are also made relatively less attractive by the significant delays, and by the difficulty of reliably estimating likely journey times. In addition to this, unpredictable journey times make it difficult for coach operators to meet their obligations to the Traffic Commissioner and to TfL (through the London Service Permit scheme).

2.9 Effects on the freight industry

2.9.1 It is noted above that east London has been identified in the London Plan as the having the greatest capacity for growth in Greater London, and this brings with it the need for infrastructure. The Silvertown Tunnel is critical to unblocking freight movements, and the consequent delivery and collection functions help underpin London’s economic competitiveness.

2.9.2 There have been a variety of responses from the freight industry and their clients to the challenges of congestion that they face every day at the Blackwall Tunnel.

2.9.3 For the freight delivery industry at least one major delivery company now actively plans its routeings to avoid the Blackwall Tunnel, thus meaning that other crossings and the wider surrounding road networks are consequently accommodating these diverted movements.

2.9.4 However, it is not possible for many companies, particularly local companies, to avoid using the Blackwall Tunnel to deliver goods to their customers. TfL's Business Survey carried out in summer 2015 cites the example of an engineering company which regularly faces three to four hour long journeys via the A2, which should take in the region of an hour. In extreme cases, five hour delays have occurred at the Blackwall Tunnel, forcing delivery patterns to be suspended.

2.9.5 Given such levels of congestion and the unpredictability of journey times, the Silvertown Tunnel, with the virtual removal of peak congestion, reduction of incidents, additional dedicated capacity for HGVs and ability to handle all standard height large vehicles would achieve a step change in reliability for the freight industry in east London, and would consequently support economic growth in east London and wider London.

2.10 Environmental effects

2.10.1 All motorised traffic produces emissions: on a per-vehicle basis, slow-moving and congested stop-start traffic emits more pollutants than free-flowing traffic moving at a reasonable speed. This matters because exhaust emissions lead to poor air quality locally and higher CO_2 emissions. In this respect, it is helpful to enable traffic to move freely, which would be an effect of the Silvertown Tunnel. A positive impact on local air quality would be realised when traffic queues are reduced or eliminated.

2.10.2 However this must be carefully balanced with the potential to encourage more vehicles to use the link. A user charge would assist TfL in managing this.

2.10.3 Congested conditions also exacerbate the already significant environmental impacts of large flows of traffic travelling along the A2 and A102, which is one of London's most polluted road systems.

2.11 The problems now and in the future

2.11.1 London has an excellent track record in achieving substantial mode shift from private to public transport; since 2000 the public transport mode share for London has increased by 10.6 percentage points. At the same time, public transport modes have all seen increases in trip rates. In 2013, the most recently available year of data, public transport mode share overtook private transport mode share for the first time.

2.11.2 There are many reasons for this trend towards public transport. A fundamental reason is the sustained and substantial investment in public

transport that has taken place over this period, as outlined above. Demographic factors have also been important. What is certain is that this trend has continued even with population growth. Although overall trips have increased as the population grows, public transport trips have increased much more than private transport trips. In this way, the mode share for public transport has been maintained and even increased.

2.11.3 The maintenance of this trend is important because, as shown in forecasts supporting the London Plan policies, London's population will continue to grow, and east London will accommodate much of this growth. GLA forecasts are that London will grow by around 1.2m people between 2011 and 2031 (see Figure 2-22 and Figure 2-23). The boroughs in the east and south east sub-regions are expected to accommodate 37% of this growth, and the three Silvertown tunnel host boroughs plus the London Borough of Barking and Dagenham, to accommodate 23% of London's growth.

Figure 2-22: Population growth projection (2011-2031)

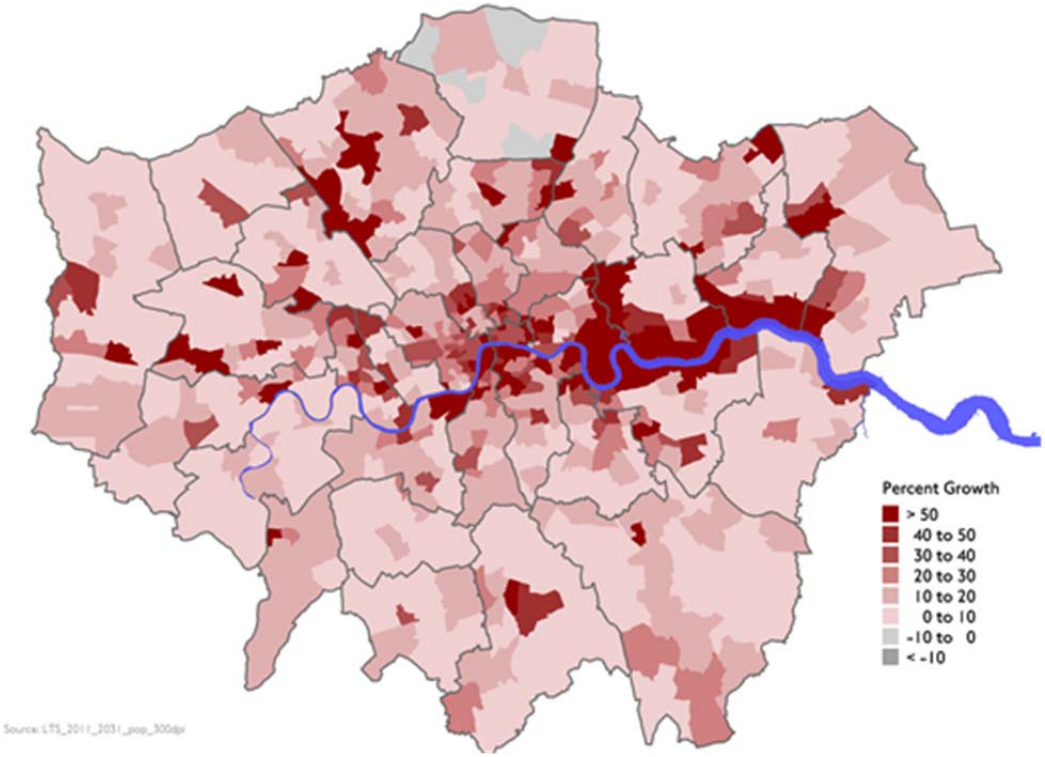
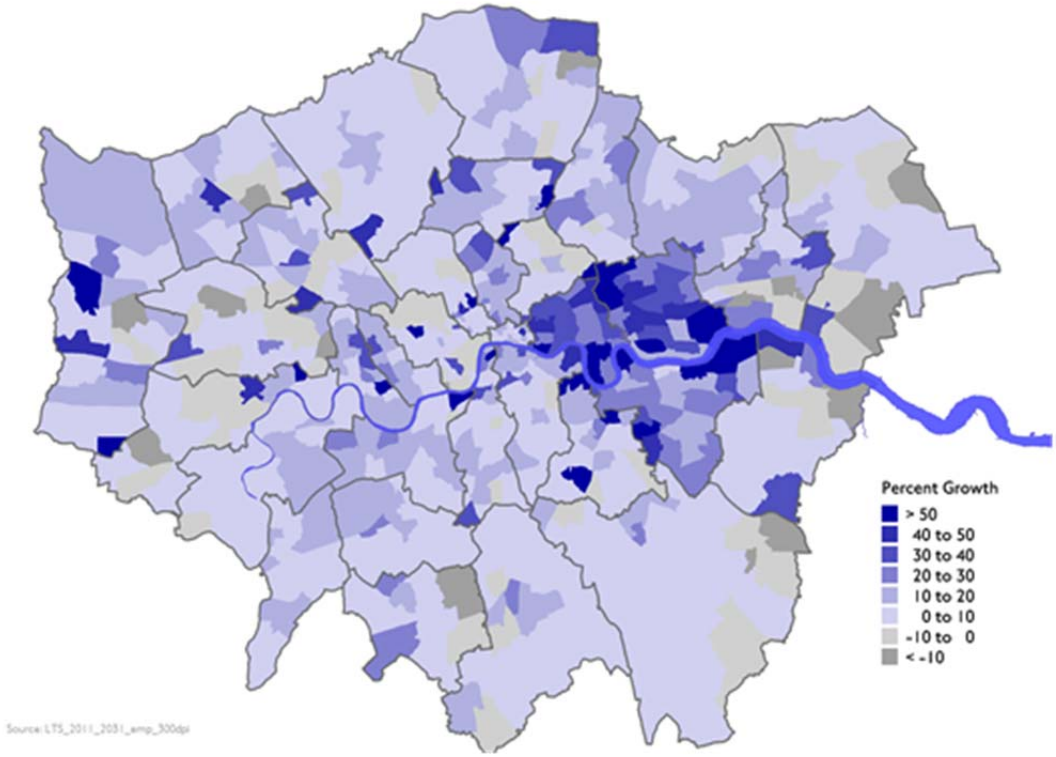


Figure 2-23: Employment growth in London (2011-2031)

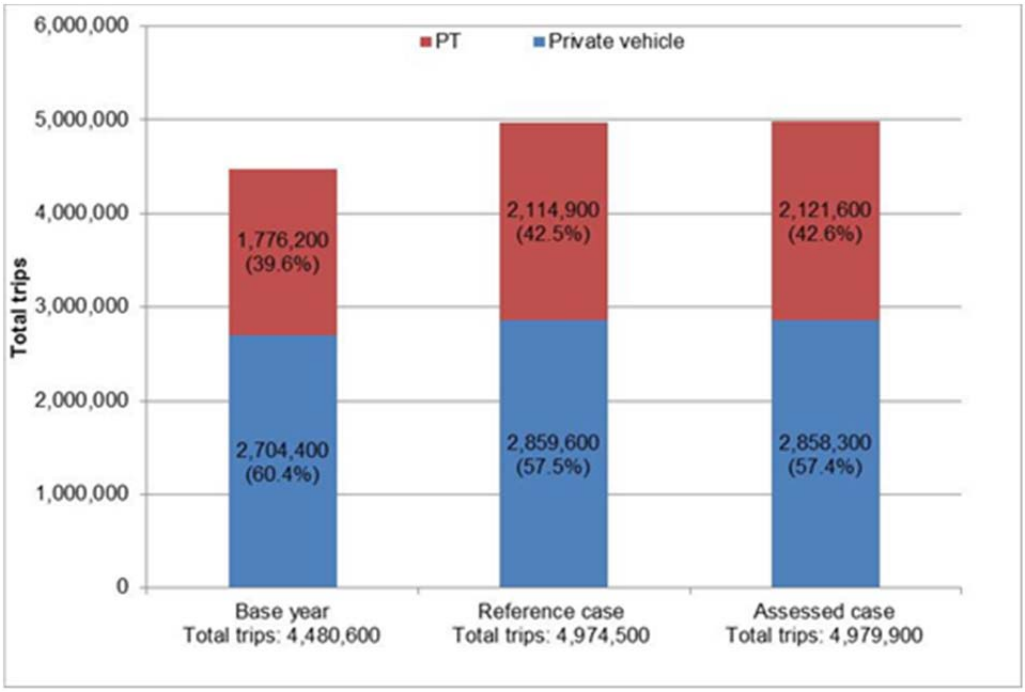


2.11.4 As a consequence of this increased population and employment, the overall number of trips will increase. Around three million more trips are expected to take place each day by 2031, an increase of around 15 per cent on the baseline 2008 rate. In the east and south-east, the increase in trip-making there is likely to be even bigger – up to around 30 per cent on 2008 levels.

2.11.5 While many of these additional trips will be accommodated on public transport, a proportion of these additional trips will be made by private vehicle. The Mayor's Transport Strategy (MTS) sets out a clear commitment to sustainable transport and a continued increase in public transport, walking and cycling mode share (Policy 11). This has so far been achieved.

2.11.6 Figure 2-24 compares the mode shares for the base year of 2012 and two future scenarios in 2021: the Reference Case (without the Scheme) and the Assessed Case (with the Scheme). As can be seen, the majority of new trips in the east sub-region in 2021 are anticipated to be accommodated by public transport. However, the growth in absolute numbers of trips is such that a relatively small increase in highway travel is inevitable. The public transport mode share is expected to increase from its current level to around 42 per cent in 2021, regardless of whether the Scheme is in place.

Figure 2-24: Total trips by mode in east sub-region, 2012 base year and 2021 Reference Case and Assessed Case (0700-1900)



2.11.7 It is worth reiterating in this context the significant investment in rail-based cross-river transport which has characterised east London in the past twenty years and has been referred to above. Public transport links constitute a much greater proportion (two-thirds) of all crossings in east London than is the case in west London (where they account for less than half of all cross-river links).

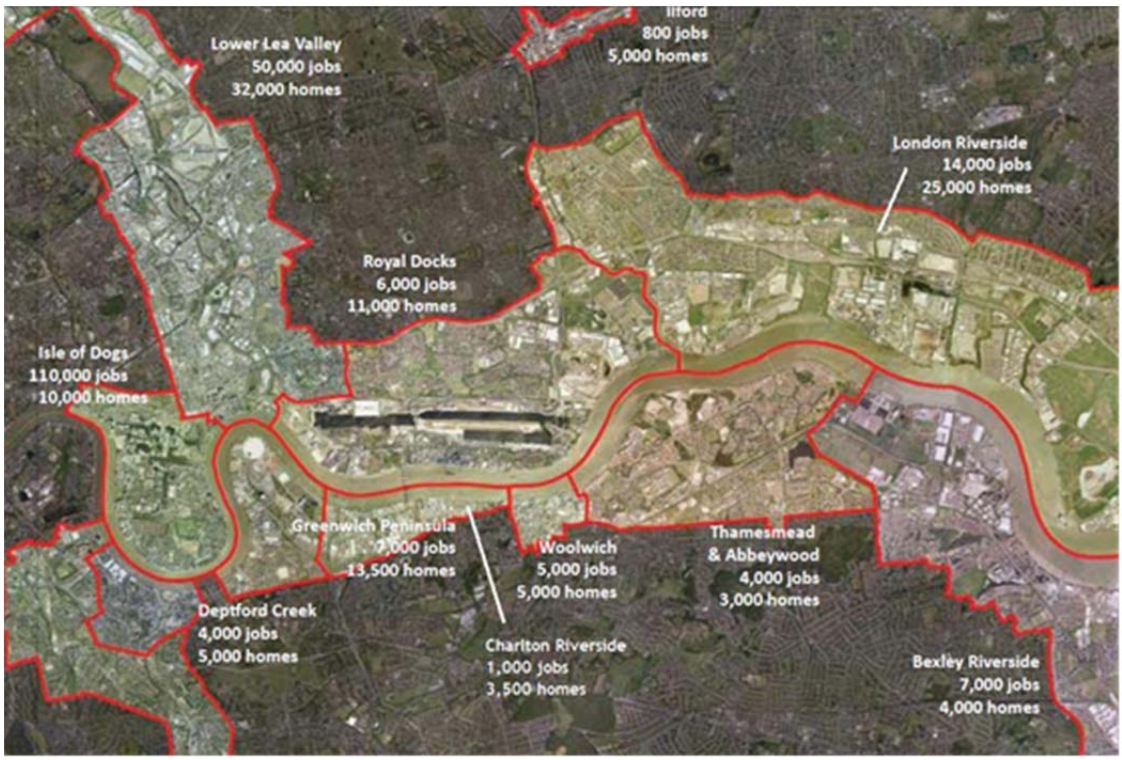
2.11.8 In the 2021 scenarios, the continued investment in public transport (particularly the opening of Crossrail) is reflected in the mode share. The Silvertown Tunnel is not expected to significantly increase demand for cross-river trips and demand would be managed by the user charge.

2.11.9 In summary, the evidence from the past decade is that with sufficient investment in public transport, private transport's share of trips does not increase: this is also borne out by the modelling undertaken for the Silvertown Tunnel in the future.

2.11.10 However, public transport alone cannot solve the three problems identified at the Blackwall Tunnel. The problems of congestion, closures and resilience can only be addressed by a road crossing. The forecast of significant employment and population growth in east London that has been described means that the need for this road crossing is even more pressing.

2.11.11 The Blackwall Tunnel passes under the River Thames in proximity to three of the most active Opportunity Areas in London: the Greenwich Peninsula and the Royal Docks (designated an Enterprise Zone in March 2011) between them have the potential to accommodate 13,000 new jobs and 24,500 new homes. The Isle of Dogs has the potential to accommodate 110,000 jobs and 10,000 new homes (Figure 2 25).

Figure 2-25Anticipated growth in the surrounding area



2.11.12 It is important, however, to recognise that the road traffic problems described here are causing economic and environmental problems today. The case for the Silvertown Tunnel scheme is not made exclusively in response to the need for accommodate forecast growth, but the adverse consequences of not acting on these problems will be much greater in the context of this growth. The problems of the Blackwall Tunnel could threaten the viability of the east and southeast sub-regions to develop as planned.

2.11.13 Plans for a new road crossing in the vicinity of the Blackwall Tunnel date back to at least the mid-1990's, and land was safeguarded for this purpose in 1997. Much of the land around the safeguarded area is now high-density residential, and more development is forthcoming both on the Peninsula and at Royal Docks. Although the safeguarding means that it is feasible now to build a tunnel, competing demands for space will make this more difficult in the future. Without timely action, the land needed for

the tunnel at the north and south sides of the River Thames will be used for new buildings and the opportunity to construct the Silvertown Tunnel could be permanently lost.

2.12 Summary of the case for change

2.12.1 Substantial growth is forecast in London over the next 15 years - with an estimated ten million people expected to reside in the Capital by 2030. With this growth comes increased pressure on existing infrastructure, services and connections to move our people and goods. Within London, it is the east sub-region which will see the biggest increase in population, housing and employment.

2.12.2 Transport for London (TfL) is planning for the impacts of this growth. Fundamental to accommodating this growth in a sustainable manner will be measures to overcome poor connectivity in east London. In particular it is necessary to address the severance caused by the River Thames.

2.12.3 This will require investment across the board in river crossings which improve connections for pedestrians, cyclists, public transport and road users. TfL has developed plans for a series of new crossings, many of which are now being progressed through the River Crossings programme.

2.12.4 The River Thames acts as a significant barrier in east London, where the river is relatively wide, making it difficult and costly to construct crossings, and the need to accommodate tall ships is an impediment to bridges. What river crossings there are reflect the development of London, and in the east, road-based river crossings are few in number: the Rotherhithe Tunnel, the Blackwall Tunnel and the Woolwich Ferry. All of these are capacity-constrained and of an outdated design. Because of its position connecting major roads in east London, and the lack of proximate alternatives, the Blackwall Tunnel has become east London’s most important strategic road crossing.

2.12.5 However it is currently subject to three significant transport problems: congestion, frequent closures and incidents, and a lack of resilience (owing to the lack of proximate alternative crossings).

2.12.6 These issues lead to adverse effects on the economy and local environment, and act as a constraint on cross-river public transport in the form of buses and coaches. In the context of continued population and employment growth, there is likely to be a compounding effect whereby escalating transport demand puts further strain on the Blackwall Tunnel (resulting in even more congestion and delay) and the economic effects of

these problems are felt even more acutely, ultimately serving to impede rather than support forecast growth.

2.12.7 In contrast, public transport crossings in east London have multiplied in recent years: six new rail crossings, with a further crossing to come in the form of Crossrail. This means that by 2020, there would be as many rail crossings to the east of Tower Bridge as to the west of Vauxhall Bridge. Despite this massive growth in public transport, demand for the Blackwall Tunnel has not fallen-some trips are not easily switched to public transport: most freight is carried by road, for example.

2.12.8 TfL has developed the Scheme as the best option to address the three problems of the Blackwall Tunnel. Once the Silvertown Tunnel becomes operational, a user charge would be applied at both Blackwall and Silvertown tunnels. The user charge would help to manage demand for both crossings and keep traffic levels within appropriate limits, and help to pay for the new Tunnel.

2.12.9 Most cross-river travel is undertaken by public transport and this is expected to continue even with the Silvertown Tunnel. Rather, most of the demand for the new tunnel would come from vehicles which would otherwise be queuing to use the existing crossings (and experiencing increasing delay and congestion owing to underlying traffic growth).

2.12.10 All users of the Blackwall and Silvertown tunnels - including bus and coach passengers - would experience shorter journey times to cross the River Thames as a result of the Scheme, with journey time savings on the immediate approaches to the tunnels of up to 20 minutes in peak periods. Journey time reliability would also be greatly improved and drivers are more likely to travel at the time of their choosing, rather than adapt their journey time to avoid the worst of the congestion. Overall levels of traffic would not increase, because of the demand management effect of the charge and the existence of new public transport alternatives. The user charge would maximise time-savings and lock them in for the future.

2.12.11 Additionally, the new scheme would bring benefits to bus and coach users by enabling new services and faster journey times: a significant proportion (19%) of users of the Silvertown Tunnel would be on public transport.

2.13 Scheme objectives

2.13.1 Scheme objectives were identified with reference to the need for the scheme summarised above, and also draw from the National Policy Statement for National Networks, Mayoral policy as defined in the London Plan and Mayor’s Transport Strategy (MTS), and scheme development

work undertaken to-date and described in more detail later in this chapter. The following scheme objectives have been adopted – the Case for the Scheme sets out how these align to the above policies.

- PO1: to improve the resilience of the river crossings in the highway network in east and southeast London to cope with planned and unplanned events and incidents;
- PO2: to improve the road network performance of the Blackwall Tunnel and its approach roads;
- PO3: to support economic and population growth, in particular in east and southeast London by providing improved cross-river transport links;
- PO4: to integrate with local and strategic land use policies;
- PO5: to minimise any adverse impacts of any proposals on communities, health, safety and the environment;
- PO6: to ensure where possible that any proposals are acceptable in principle to key stakeholders, including affected boroughs; and
- PO7: to achieve value for money and, through road user charging, to manage congestion.

2.14 Option development and assessment

2.14.1 TfL has assessed a range of options against their potential to address the identified problems – this process and details of the different options considered is set out in the Case for the Scheme. The assessment might be considered as having two parts: the strategic assessment of options, and the refinement of the Silvertown Tunnel option in the light of the scheme objectives – the detail of this option assessment is set out in the Case for the Scheme[38.]

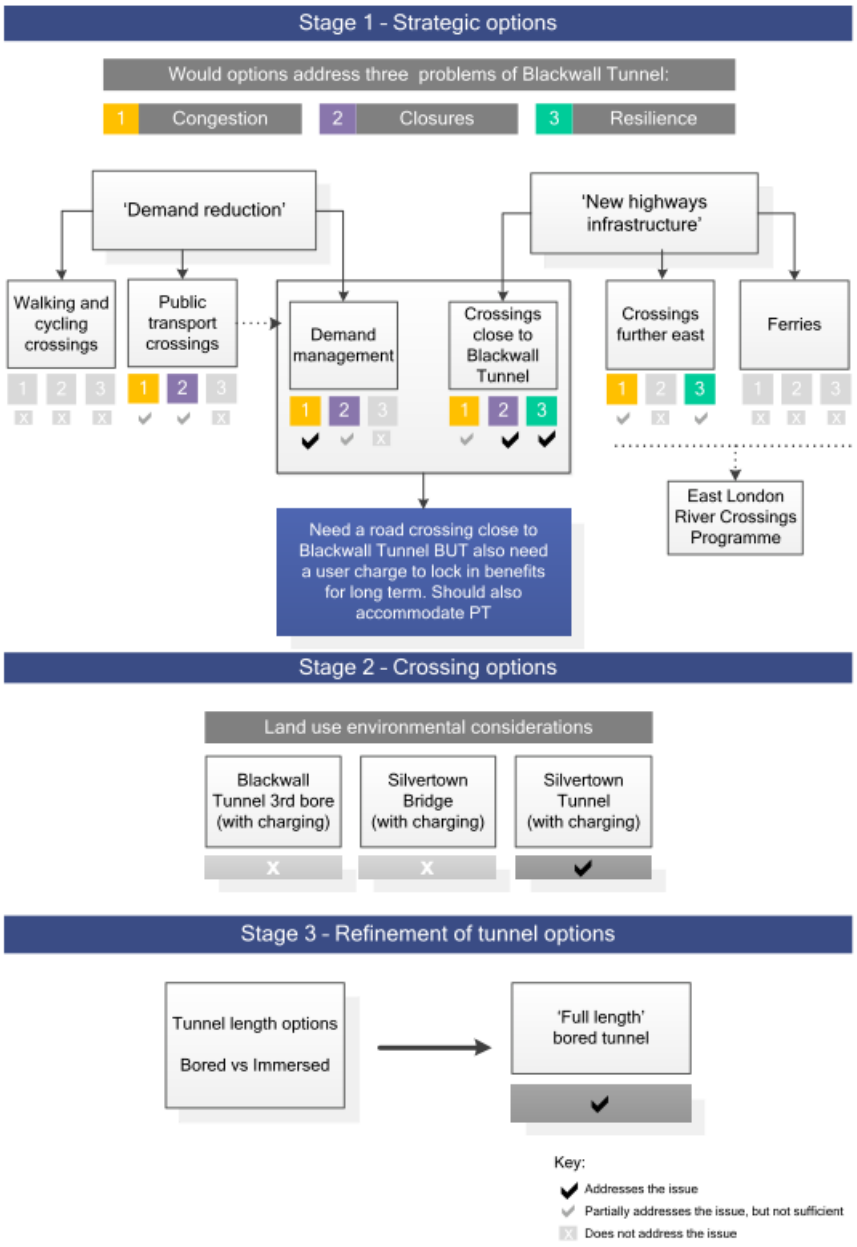
2.14.2 Figure 2-26 (from the Case for the Scheme) summarises the three-stage process of developing the Silvertown Tunnel scheme. In Stage 1 the problems were identified and a wide range of potential options assessed. In the second stage the options assessment informed policy development in the MTS and the London Plan. In the final stage, the detail of the Silvertown Tunnel scheme was developed.

[38] TfL, September 2015

2.14.3 TfL has considered a broad range of cross-river transport options including options set out in studies in 2009[39], options arising from consultation responses and its own recent work. These options can be divided into two broad categories, which can be referred to as Category A and B. Options in Category A have in common a focus on reducing the level of cross-river highway demand, sometimes through the provision of enhanced alternatives (including walking and cycling measures and public transport improvements) and sometimes through direct demand management (such as road user charging). Options in Category B include those which would entail the provision of new highway infrastructure capacity and/or connections.

[39] Transport for London (May 2009) New Thames Crossings Assessment of Need; Hyder (Jul 2009) New Thames River Crossings Initial Engineering Feasibility Review; TfL Planning & Corporate Panel (Jun 2009) Update on east London River Crossings; Mott MacDonald (Nov 2009) New Thames River Crossings, Silvertown Tunnel Option Volume 1; Mott MacDonald (Dec 2009) New Thames River Crossing, Greenwich to Silvertown Bridge Option

Figure 2-26 Summary of the strategic options development and assessment process



2.14.4 The conclusion from this analysis was that no single approach can fully address all of the three identified transport problems at the Blackwall Tunnel. Congestion can be managed through price-based demand management, closures would benefit from both demand management and enhancements to the network, while resilience can only really be delivered through enhancing the road network. Options which rely solely on demand management either through road user charging, public transport, or a combination of the two cannot fully address the Blackwall Tunnel's problems.

2.14.5 Hence, blended solutions, combining the effective aspects of highway enhancements and demand management represent the only effective solutions to the problems of the Blackwall Tunnel. An additional consideration here is the need to assure benefits in the longer-term, which a user charge would enable. With this outcome in mind, a highway crossing with a user charge emerged as the best strategic option.

2.15 Preferred Option – the Silvertown Tunnel concept

2.15.1 The preferred option scheme – known as the Silvertown Tunnel – would comprise a new dual two-lane connection between the A102 Blackwall Tunnel Approach on Greenwich Peninsula (London Borough of Greenwich) and the Tidal Basin roundabout junction on the A1020 Lower Lea Crossing/A1011 Silvertown Way (London Borough of Newham) by means of twin tunnel bores under the River Thames and associated approach roads. The Silvertown Tunnel would be approximately 1.4km long and would be able to accommodate large vehicles including double-deck buses. The Boord Street footbridge over the A102 would be replaced with a pedestrian and cycle bridge.

2.15.2 New portal buildings would be located close to each portal to house the plant and equipment necessary to operate the tunnel, including ventilation equipment.

2.15.3 The introduction of free-flow user charging on both the Blackwall and Silvertown Tunnels would play a fundamental part in managing traffic demand and support the financing of the construction and operation of the Silvertown Tunnel. The design of the tunnel would include a dedicated bus/coach and HGV lane, which would provide opportunities for TfL to provide additional cross-river bus routes.

2.15.4 Main construction works would likely commence in 2018 and would last approximately 4 years with the new tunnel opening in 2022/23. The main site construction compound would be located at Silvertown to utilise Thames Wharf to facilitate the removal of spoil and delivery of materials by river. A secondary site compound would be located adjacent to the alignment of the proposed cut and cover tunnel on the Greenwich peninsula.

Figure 2-27: Silvertown Tunnel location

2.15.5 The tunnel would make a very significant contribution to a reduction in the number of incidents occurring at the Blackwall Tunnel; clear signing would be provided to guide over-height vehicles towards the Silvertown Tunnel. When incidents do occur at the Blackwall Tunnel, the Silvertown Tunnel would provide a very clear diversionary route for traffic, to ensure that the effects are contained and do not cause such major congestion as currently occurs. Whilst there would be a loss of capacity across the network at these times, resulting in some queuing at the approaches, the impacts of these may only be felt during peak periods and the delays would be very small compared to the current position where no practical diversion route exists.

2.15.6 Journey times in the peak direction would be greatly reduced under this option and the delays for current Blackwall Tunnel users (of around 20 minutes northbound during morning peak periods) are likely to be effectively eliminated.

2.15.7 A tunnel would offer a relatively fast and direct route into the Canary Wharf and Royal Docks areas from the south and, in addition, a full gauge road tunnel between the Greenwich Peninsula and the Royal Docks enables opportunities for new cross-river bus services, further improving connectivity.

2.16 The role of road user charging

2.16.1 The User Charging Note[40] describes how TfL proposes to charge for the use of the Silvertown and Blackwall Tunnels for two principal reasons:

- to help manage the demand for both crossings and keep traffic levels within acceptable limits; and
- to help raise money to pay for the construction and operation of the new tunnel.

2.16.2 With regard to managing demand, the Silvertown Tunnel on its own would add highway capacity which would address the three main transport problems of the Blackwall tunnel. However, unless appropriately managed, there is the potential that it would attract additional traffic to increase, offsetting the benefits of the scheme - user charging can 'lock in' these benefits by controlling demand for the tunnel.

2.16.3 TfL has considered the potential to use other sources of funding, including a Mayoral or borough Community Infrastructure Levy (CIL) and other sources of public sector funding. However, there would be a need to weigh the potential negative impacts on economic development for the former and given current constraints, the latter is unlikely to be forthcoming. Crucially, none of these options would manage demand and since this is the most important function of the charge, consequently a user charge would need to apply in addition to any other funding mechanisms.

2.16.4 There are a number of other benefits from having a charge. It can mitigate some of the environmental effects of the new tunnel (including social effects, for example), helping to manage the road network and support growth.

2.16.5 TfL has examined the potential for not charging, but this does not achieve the project objectives.

2.16.6 Both Blackwall and Silvertown tunnels would be charged. It is important to apply a charge at both tunnels in order to prevent drivers switching from a single charged tunnel to a 'free' tunnel and so maintain the decongestion benefits overall. This is especially important given the proximity and shared approach road of the two tunnels. However, the scheme does not necessitate a user charge at the two other nearby crossings, the

[40] TfL, September 2015

Rotherhithe tunnel and the Woolwich Ferry. It is not expected that a significant number of drivers would divert to either of these to avoid the charges at Blackwall/Silvertown tunnels.

2.16.7 TfL anticipates that charging would be a long-term measure, continuing for at least as long as its traffic-management effects are required. TfL proposes to apply for powers to vary the charge in the future to ensure that it continues to meet its objectives and maintain a balance between its different effects. In doing so, TfL would have regard to:

i. Traffic and transport and TfL's network management duty and transport objectives.

ii. Environment to ensure that the effects of the proposed charge on the environment would not be worse than those reported in support of the DCO application.

iii. Economy to ensure that the effects of the proposed charge would support the performance of the local economy, the ability of residents to access employment opportunities and the delivery of new housing.

iv. Financial to consider the effect of revenue from user charge in the context of contributing to the cost of financing, constructing and maintaining the new tunnel.

2.17 Stakeholders

2.17.1 As previously described, TfL has recently carried out three non-statutory consultations of the east London River Crossings Programme. For the consultations, stakeholders were identified as belonging to several broad groups:

- Statutory Stakeholders, comprising Highways England, the Environment Agency, the Port of London Authority, the Crown Estates and the Marine Management Organisation;
- Affected boroughs, comprising the elected members and officers in the London Borough of Newham, the Royal Borough of Greenwich, the London Borough of Tower Hamlets, the London Borough of Barking and Dagenham, the London Borough of Bexley and the London Borough of Southwark;
- Interested Local Authorities, comprising the elected members and officers of all other London Boroughs, the County Councils of Essex, Hertfordshire, Kent and Surrey, the District Councils of Brentwood,

Broxbourne, Dartford, Epping Forest, Sevenoaks, Tandridge, Thurrock and Welwyn Hatfield, the elected members of the London Assembly, local Members of Parliament, London Travel Watch, the Local Government Ombudsman and the London Thames Gateway Development Corporation;

- National Trade Associations and Interest Groups, comprising Emergency Services, motorists' organisations (AA, RAC, Green Flag), the Confederation of Passenger Transport, the Road Haulage Association, the Freight Transport Association, the National Motorcycle Council, the London Cycling Campaign, Living Streets, the Institute of Advanced Motorists, English Heritage, Sustrans, Road Peace, BIDS, London First, the Confederation of British Industry, the Institute of Directors and Environmental Groups; and

- Local Networks and Groups (within the affected boroughs), comprising residents, businesses, public service institutions (schools, hospitals, etc.), pedestrians, cyclists, motorists, public transport users, people with disabilities, people with mobility issues (including older people), people who work, deliver or collect in the area and national and international businesses that rely on transportation.

2.17.2 There would be ongoing liaison with these stakeholders in relation to the project, and mapping of views and requirements and where these could conflict.

3. THE ECONOMIC CASE

3.1 Introduction

3.1.1 The Economic Case for the Silvertown Tunnel project has been prepared following the guidance set out in the DfT's Transport Appraisal Guidance (TAG)41. TAG sets out, for transport schemes, the requirements of HM Treasury's Green Book (A Guide to Investment Appraisal in the Public Sector). The Green Book is used across government for investment decisions through identification, selection and appraisal of options.

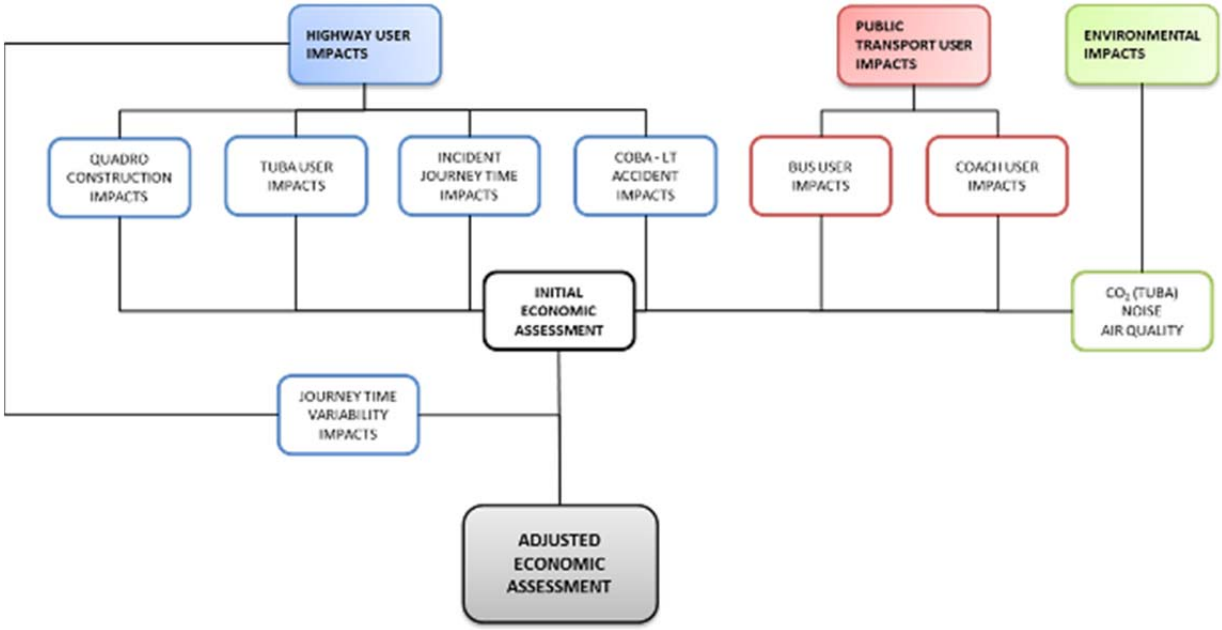
3.1.2 The Economic Case assesses the impacts and the Value for Money (VfM) implications of all the options outlined in the business case. The economic, environmental, social, distributional and fiscal impacts of a proposal are assessed using qualitative, quantitative and monetised information.

- In TAG guidance, the VfM assessment follows a staged process, the conclusions of which are summarised in an Appraisal Summary Table (AST). The stages are as follows, and Figure 3-1 shows the specific inputs to the Silvertown Outline Business Case:
- Firstly impacts are monetised, valued and presented to provide an initial assessment in an Analysis of Monetised Costs and Benefits (AMCB) table. This typically includes business impacts (business users and providers), social impacts (commuting and other users, accidents, physical activity and journey quality), environmental impacts (noise, air quality, greenhouse gas) and public accounts impacts (cost to broad transport budget, indirect tax). Costs assessed include the investment and operating costs which include capital renewal and maintenance costs.
- Secondly further quantitative and qualitative information is added – this provides an adjusted assessment. Further impacts that are typically monetised are wider impacts, reliability, landscape, option and non-use values. In addition other aspects that are not usually monetised, such as townscape, heritage, biodiversity, water, security, access to services, affordability and severance are also analysed.
- This adjusted assessment provides an initial VfM assessment.

[41] November 2014 TAG databook and TAG Unit A1.3 – User and Provider Impacts, DfT, 2014

- Finally the benefits, costs, risks and sensitivities of the project are combined to provide a VfM statement.

Figure 3-1 Economic case components



3.1.3 The Assessed Case (Do-Something with the scheme in place) is compared to the Reference Case and the benefits and costs are calculated in terms of changes from this case. The Reference Case comprises the current road and tunnel layout, configuration and method of operation, and is assumed to continue for the standard road scheme appraisal period of 60 years with minimal change. Any committed network changes and known land use changes are included. This Reference Case is known as the ‘Do Minimum’ scenario.

3.1.4 The preferred option of having the Silvertown Tunnel in place and operational, and with user charging in force at both Silvertown and Blackwall Tunnels to raise revenue and assist with the management of traffic demand, is the ‘Do Something’ scenario. This too is assessed for a period of 60 years from implementation to enable the comparison with the ‘Do Minimum’ scenario to be made.

3.1.5 Details of the economic analyses and assumptions underpinning the economic case are set out in the Silvertown Tunnel Economic Assessment Report (EAR), TfL, September 2015, summarised below. The monetised benefits included in the present economic appraisal are derived from the transport models prepared by TfL to estimate the effects

of the implementation of the Silvertown Tunnel[42]. The model determines estimated likely traffic flows on public transport and on each main road in the East sub-region. The differences in journey times and costs for all trips between origin and destination zones in the models between the 'Do Minimum' and 'Do Something' scenarios have been calculated using the DfT Transport User Benefit Appraisal (TUBA) computer program or bespoke analysis based on TAG, and results have been expressed in monetised form. The monetisation is carried out using standard values published by the DfT in the TAG data book.[43]

3.1.6 The main assessment of the VfM of the Silvertown scheme has been carried out by calculating the project's Net Present Value (NPV), supported by the other assessments described above. The NPV is one of the outputs of the AMCB table, and is the difference between the monetised costs and benefits of the scheme, all discounted to a present value, in this case to a 2010 base price year.

The Silvertown Crossing User Charging Note sets out a range of charging options to manage demand for the river crossings. The peak charge rates[44] used for the assessed case are shown in

3.1.7 Table 3.1.

Table 3.1 Charges for the Assessed Case

Charge per trip in 2015 prices (during charging hours: 6 am to 10 pm)			
User type	Account holder		Non account holder
Charge rates	Off peak charge	Peak charge	Headline charge
Time	Weekdays **outside of peak** period and all times on weekend	Weekday **peak periods** between 6-10am going Northbound **and** 4-7 pm going Southbound	At all times

[42] Silvertown Tunnel Economic Assessment Report, TfL, September 2015
[43] Tag Databook, DfT, Nov. 2014
[44] 5.7 The charging scheme is proposed to apply during the day between 6 am and 10 pm. Night travel between 10 pm and 6 am is proposed to be free for all users as there is relatively low demand during these times. The peak charge rates only apply to account holders northbound between 6am and 10am and southbound between 4pm and 7pm, and apply at all times 6am to 10pm for non-account holders.

Charge per trip in 2015 prices (during charging hours: 6 am to 10 pm)			
User type	Account holder		Non account holder
Charge rates	Off peak charge	Peak charge	Headline charge
Motorcycle , moped, motor tricycle	£1.00	£2.00	£3.00
Car and small van	£1.00	£3.00	£4.00
Large van	£1.65	£5.00	£6.00
HGVs	£4.00	£7.50	£8.50
Bus ,Coach and minibus	Free (100% discount)		

3.2 Headline scheme benefits

3.2.1 The economic analysis has been summarised in three key economic results:

- present value of benefits (PVB) giving the monetised value of all user benefits arising from the Scheme;
- present value of costs (PVC) giving the cost to the public sector of constructing, maintaining and operating the new infrastructure. Revenue from user charges collected by the public sector is included in this output; and
- net present value (NPV) for the Scheme, being the difference between the PVB and PVC values. A positive NPV indicates that a scheme would have overall benefits to the economy after costs are deducted.

3.2.2 All the benefits and costs mentioned in this section are in 2010 prices, discounted to 2010, and are for the 60-year appraisal period unless otherwise specified.

3.2.3 TAG advice is that reliability benefits should normally be considered for an ‘adjusted’ appraisal after calculating an initial economic assessment, and accordingly for many analyses both an ‘initial’ and ‘adjusted’ outcome is shown. However given that reliability is a key objective of the Scheme, and that extensive data has been available to estimate the reliability benefits (see Appendix F of the EAR), these are regarded by TfL as an integral part of the case for the scheme.

3.2.4 The three key economic results for the Silvertown Tunnel Scheme are given in Table 3.2 and are shown in 2010 prices.

3.2.5 The Scheme has an initial positive Net Present Value of £976m (without reliability benefits) and an adjusted NPV of £1,273m (with reliability benefits) over 60 years – it therefore has a very positive economic outcome.

Table 3.2 Summary economic results for Silvertown Tunnel (£m, 2010 prices)

Economic measure	Initial (without reliability benefits), £m	Adjusted for reliability benefits, £m
Present value of benefits (PVB)	£971	£1,268
Present value of costs (PVC)[45]	-£5	-£5
Net present value (PVB-PVC)	£976	£1,273

Within the overall summary, the main impact by user or provider groups is shown in Table 3.3 (initial assessment) and

3.2.6 Table 3.4 (adjusted assessment, which shows the additional journey time variability benefits for road users).

3.2.7 Both tables show in the second column that all user classes (commuting, business and other trips) have positive net benefits (benefits less charges) over the 60 year appraisal period – in total this amounts to £1,069m net benefit (£1,367m with reliability added).

3.2.8 The tables also show high net user benefits for all vehicle types apart from Light Goods Vehicles (LGV's) in Table 2 only and Heavy Goods Vehicles (HGV's) in both tables.

3.2.9 TfL proposes to vary the charge by vehicle type to reflect the amount of road space occupied, the contribution to congestion, the emissions and the wear and tear to the road surface caused by different types of vehicles. Consequently HGV's pay the highest charges, and this impacts their net user benefits. These are also affected by the fact that only the

[45] A negative cost means a surplus of revenue over costs, in this case due to revenue from the crossing charge

drivers' value of time is included in the benefits (rather than e.g. the value of goods carried), and there is some evidence that this is undervalued. The employer survey for the scheme found that nearly a third of respondents that use HGVs said the Scheme would increase their customer base even taking into consideration the charge for using it.

3.2.10 A summary therefore is that car users, coach and bus passengers have overall high net benefits from the appraisal, LGV's have smaller net benefits and HGV's have some disbenefits.

Table 3.3 Summary economic results (initial) by users (£ 000s, 2010 prices)

User Class	All modes	Cars	LGV's	HGV's	Coach	Bus
Commuting	£259	£11			£120	£128
Other	£474	£71				£403
Business	£337	£447	-£40	-£130		£60
Total	**£1,069**	**£529**	**-£40**	**-£130**	**£120**	**£591**

Table 3.4 Summary economic results (adjusted for reliability) by users (£ 000s, 2010 prices)

User Class	All modes	Cars	LGV's	HGV's	Coach	Bus
Commuting	£291	£44			£120	£128
Other	£556	£153				£403
Business	£519	£539	£26	-£107		£60
Total	**£1,367**	**£737**	**£26**	**-£107**	**£120**	**£591**

3.3 User charging and the economic case

3.3.1 The nature of the scheme, and the proposal to manage travel with a user charge, has a significant effect on the economic outcomes of the scheme. It was noted above how TfL intends to apply for powers to vary the charge in the future to ensure that it continues to meet its objectives and maintain a balance between its different effects.

3.3.2 The Assessed Case shows how this balance is struck with current charging and modelling assumptions. In simple terms this Case shows how the Scheme and an associated charge can be used to:

- effectively remove existing severe congestion and significantly improve reliability and resilience; and

- discourage growth in some cross-river highway travel, but facilitate such travel particularly for business and public transport users.

3.3.3 The effect of this is mirrored in the economic outcomes estimated for the 60 year appraisal period:

- Car and LGV business users experience significant additional benefit, and the volumes of these users crossing the river increase.
- Car non-business (including commuters) experience virtually no change in benefit, and the numbers of such travellers crossing the river reduce.
- Public transport users, in particular bus and coach users, experience significant benefit, and there is a consequent mode shift from car to public transport in line with TfL strategic objectives.
- Goods vehicles (HGV's) in the appraisal experience disbenefits, and there is a small reduction in cross-river HGV movements. However the report notes that the modelling and appraisal only values the driver's time, with no value placed on the goods carried, and it is therefore highly likely that such benefits are undervalued. The user charges for goods vehicles are in line with those at the Dartford Crossing, which is used extensively by goods vehicles.

3.4 Transport economic efficiency (TEE)

3.4.1 The transport economic efficiency outcomes for the preferred option are shown in Table 3.5 and Table 3.6.

3.4.2 It should be noted that the present value of benefits presented in Table 3.5 includes elements of highway, public transport (bus and coach) and travel time savings due to reduction in incidents (over-height vehicles and major incidents), while Table 3.6 has in addition reliability (journey time variability) benefits. These net benefits are after taking into account the charges paid by users and any user delay costs during construction and future maintenance.

3.4.3 The present value of Transport Economic Efficiency benefits (TEE) without inclusion of reliability benefits (see Table 3.5) is estimated at £936m, with some £337m of this being attributable to business users, some £259m attributable to commuting and £474m attributable to the 'other' category (other items in the TEE table relate to changes in public transport revenue and operating costs).

3.4.4 The corresponding TEE present value with additional reliability benefits (see Table 3.6) is estimated at £1,234m, with some £519m of this being attributable to business users, about £291m to commuting and about £556m attributable to the ‘other’ category.

Table 3.5 Transport Economic Efficiency (initial), £ 000s

Non-business: Commuting	**ALL MODES**		**ROAD**	**coach**	**bus**	**OTHER**
User benefits	**TOTAL**		**Private Cars**	**Passengers**	**Passengers**	
Travel time	£396,762		£149,102	£119,660	£128,000	
Vehicle operating costs	£13,356		£13,356			
User charges	-£149,902		-£149,902			
During Construction & Maintenance	-£1,597		-£1,556		-£41	
COMMUTING	£258,619	*(1a)*	£11,000	£119,619	£128,000	£0
Non-business: Other						
User benefits						
Travel time	£734,362		£331,362		£403,000	
Vehicle operating costs	£22,316		£22,316			
User charges	-£278,255		-£278,255			
During Construction & Maintenance	-£4,778		-£4,621		-£157	
NET NON-BUSINESS BENEFITS: OTHER	£473,645	*(1b)*	£70,802	-£157	£403,000	£0
Business						
			Goods Vehicles			
User benefits			**(OGVs&LGVs)**	**Business Cars**	**Passengers**	**Passengers**
Travel time	£964,740		£348,737	£556,003		£60,000
Vehicle operating costs	£67,576		£43,817	£23,759		
User charges	-£690,447		-£559,352	-£131,095		
During Construction & Maintenance	-£4,936		-£2,985	-£1,900	-£51	
Subtotal	£336,933	*(2)*	-£169,783	£446,767	-£51	£60,000	£0
Private sector provider impacts						**Passengers**
Revenue	£174,000				0	£174,000	
Operating costs	-£307,040				£0	-£307,040	
Investment costs					0	£0	
Grant/subsidy					0	£0	
Subtotal	-£133,040	*(3)*			0	-£133,040	£0
Other business impacts						
Developer contributions		*(4)*					
NET BUSINESS IMPACT	£203,893	*(5) = (2) + (3) + (4)*					
TOTAL						
Present Value of Transport Economic Efficiency Benefits (TEE)	£936,157	*(6) = (1a) + (1b) + (5)*					

Notes: Benefits appear as positive numbers, while costs appear as negative numbers.
All entries are discounted present values, in 2010 prices and values

Table 3.6 Transport Economic Efficiency (adjusted with reliability), £ 000s

Non-business: Commuting	**ALL MODES**		**ROAD**	**COACH**	**BUS**	**OTHER**
User benefits	**TOTAL**		**Private Cars**	**Passengers**	**Passengers**	
Travel time	£396,762		£149,102	£119,660	£128,000	
Vehicle operating costs	£13,356		£13,356			
User charges	-£149,902		-£149,902			
During Construction & Maintenance	-£1,597		-£1,556		-£41	
Reliability	£32,834		£32,834			
COMMUTING	£291,454	*(1a)*	£43,834	£119,619	£128,000	£0
Non-business: Other						
User benefits						
Travel time	£734,362		£331,362		£403,000	
Vehicle operating costs	£22,316		£22,316			
User charges	-£278,255		-£278,255			
During Construction & Maintenance	-£4,778		-£4,621		-£157	
Reliability	£82,684		£82,684			
NET NON-BUSINESS BENEFITS: OTHER	£556,329	*(1b)*	£153,486	-£157	£403,000	£0
Business						
User benefits			**Goods Vehicles (OGVs&LGVs)**	**Business Cars**	**Passengers**	**Passengers**	
Travel time	£964,740		£348,737	£556,003		£60,000	
Vehicle operating costs	£67,576		£43,817	£23,759			
User charges	-£690,447		-£559,352	-£131,095			
During Construction & Maintenance	-£4,936		-£2,985	-£1,900		-£51	
Reliability	£181,822		£89,393	£92,429			
Subtotal	£518,755	*(2)*	-£80,390	£539,196	-£51	£60,000	£0
Private sector provider impacts						**Passengers**	
Revenue	£174,000				0	£174,000	
Operating costs	-£307,040				£0	-£307,040	
Investment costs					0	£0	
Grant/subsidy					0	£0	
Subtotal	-£133,040	*(3)*			£0	-£133,040	£0
Other business impacts							
Developer contributions		*(4)*					
NET BUSINESS IMPACT	£385,715	*(5) = (2) + (3) + (4)*					
TOTAL							
Present Value of Transport Economic Efficiency Benefits (TEE)	£1,233,497	*(6) = (1a) + (1b) + (5)*					

Notes: Benefits appear as positive numbers, while costs appear as negative numbers.
All entries are discounted present values, in 2010 prices and values

3.5 Public accounts (PA)

3.5.1 The Scheme proposes user charging for two reasons:

- Traffic management - charging would manage demand and therefore levels of traffic passing through Blackwall and Silvertown tunnels.
- Financial - revenue generated by user charging would help pay for the new tunnel.

3.5.2 Consequently:

- the construction and operation is expected to be funded and maintained from user charges; and
- there would be residual (post charges) net benefits to users as a whole.

3.5.3 TAG guidance A1.1, section 2.8 on the Public Accounts assessment is that the Present Value Costs 'should only comprise Public Accounts impacts (i.e. costs borne by public bodies) that directly affect the budget available for transport'. For the purpose of this assessment, TfL have confirmed that the revenue would fall under the Broad Transport Budget, and hence the charge revenue has been included in the Present Value of Costs. TAG recommends that in such cases the assessment of the project should be based on the NPV, which in the present case is a positive NPV of £976m (initial) and £1,273m (adjusted for reliability benefits) over 60 years as shown in Table 3.7 and Table 3.8.

3.5.4 For schemes such as the present one that require initial capital expenditure but generate significant revenues that accrue to the 'Broad Transport Budget', TAG guidelines (TAG Unit 1.1 Cost-Benefits Analysis) also recommend calculating a metric which divides the NPV by discounted capital (or investment) costs – this provides an indication of the total benefit per pound of capital expenditure. In the present case this metric is £976m (NPV)/ £553m (capital costs) or 1.8 for the initial assessment and £1,273m/£553m or 2.3 for the assessment including reliability benefits, which reinforces the conclusion that the scheme has a very positive outcome.

Table 3.7 Public accounts (initial and adjusted with reliability), £ 000s

	ALL MODES		ROAD	COACH	BUS	OTHER
Local Government Funding	TOTAL		INFRASTRUCTURE			
Revenue	-£1,400,690		-£1,226,690		-£174,000	
Operating Costs	£843,040		£536,000		£307,040	
Investment Costs	£553,000		£553,000			
Developer and Other Contributions	0					
Grant/Subsidy Payments	0					
NET IMPACT	-£4,650	*(7)*	-£137,690	£0	£133,040	£0
Central Government Funding: Transport						
Revenue	£0					
Operating costs	£0					
Investment Costs	£0					
Developer and Other Contributions	£0					
Grant/Subsidy Payments	£0					
NET IMPACT	£0	*(8)*				
Central Government Funding: Non-Transport						
Indirect Tax Revenues	£143,184	*(9)*	£113,184		£30,000	
TOTALS						
Broad Transport Budget	-£4,650	*(10) = (7) + (8)*				
Wider Public Finances	£143,184	*(11) = (9)*				

Notes: Costs appear as positive numbers, while revenues and 'Developer and Other Contributions' appear as negative numbers.
All entries are discounted present values in 2010 prices and values.

Table 3.8 Analysis of monetised costs and benefits (initial), £ 000s

Noise	-£2,674	*(12)*
Local Air Quality	-£273	*(13)*
Greenhouse Gases	£12,100	*(14)*
Journey Quality		*(15)*
Physical Activity		*(16)*
Accidents	£35,900	*(17)*
Economic Efficiency: Consumer Users (Commuting)	£258,619	*(1a)*
Economic Efficiency: Consumer Users (Other)	£473,645	*(1b)*
Economic Efficiency: Business Users and Providers	£336,933	*(5)*
Wider Public Finances (Indirect Taxation Revenues)	-£143,184	*- (11) - sign changed from PA table, as PA table represents costs, not benefits*
Present Value of Benefits (see notes) (PVB)	£971,066	*(PVB) = (12) + (13) + (14) + (15) + (16) + (17) + (1a) + (1b) + (5) - (11)*
Broad Transport Budget	-£4,650	*(10)*
Present Value of Costs (see notes) (PVC)	-£4,650	*(PVC) = (10)*
OVERALL IMPACTS		
Net Present Value (NPV)	**£975,716**	NPV=PVB-PVC
		BCR=PVB/PVC

transport appraisals, together with some where monetisation is in prospect. There may also be other significant costs and benefits, some of which cannot be presented in monetised form. Where this is the case, the analysis presented above does NOT provide a good measure of value for money and should not be used as the sole basis for decisions.

Table 3.9 Analysis of monetised costs and benefits (adjusted for reliability benefits), £ 000s

Noise	-£2,674	*(12)*
Local Air Quality	-£273	*(13)*
Greenhouse Gases	£12,100	*(14)*
Journey Quality		*(15)*
Physical Activity		*(16)*
Accidents	£35,900	*(17)*
Economic Efficiency: Consumer Users (Commuting)	£291,454	*(1a)*
Economic Efficiency: Consumer Users (Other)	£556,329	*(1b)*
Economic Efficiency: Business Users and Providers	£518,755	*(5)*
Wider Public Finances (Indirect Taxation Revenues)	-£143,184	*- (11) - sign changed from PA table, as PA table represents costs, not benefits*
Present Value of Benefits (see notes) (PVB)	£1,268,406	*(PVB) = (12) + (13) + (14) + (15) + (16) + (17) + (1a) + (1b) + (5) - (11)*
Broad Transport Budget	-£4,650	*(10)*
Present Value of Costs (see notes) (PVC)	-£4,650	*(PVC) = (10)*
OVERALL IMPACTS		
Net Present Value (NPV)	**£1,273,056**	NPV=PVB-PVC
		BCR=PVB/PVC

Note : This table includes costs and benefits which are regularly or occasionally presented in monetised form in transport appraisals, together with some where monetisation is in prospect. There may also be other significant costs and benefits, some of which cannot be presented in monetised form. Where this is the case, the analysis presented above does NOT provide a good measure of value for money and should not be used as the sole basis for decisions.

3.6 Sensitivity tests

3.6.1 A number of economic sensitivity tests have been undertaken.

3.6.2 A simple test was undertaken of the percentage change in key factors (individually) that would be needed to reduce the NPV (initial) from £976m to £500m (over 60 years) – this would still represent a significant NPV and good economic outcome, rather than for example a 'break-even' outcome. This indicated that:

- User time benefits would have to reduce by 23% (from £2,096m to £1,620m);
- net user benefits would need to reduce by 44% (from £1,069m to £593m);

- Investment costs would need to increase by 86% (from £553m to £1,029m); and;
- total revenue would need to decrease by 34% (from £1,401m to £925m).(We note that revenue has a more complex effect on the economic outcomes, but this gives some indication of impact).

3.6.3 The tests showed that user time benefits would have to reduce by 23% (from £2,096m to £1,620m), and net user benefits would need to reduce by 44% (from £1,069m to £593m). Investment costs would need to increase by 86% (from £553m to £1,029m); and total revenue would need to decrease by 34% (from £1,401m to £925m).(We note that revenue has a more complex effect on the economic outcomes, but this gives some indication of impact).

3.6.4 Clearly this is simplistic, as one or more factors could vary in conjunction with each other, but it indicates that significant changes are required in these key variables before the scheme would not be regarded as a good investment. This assessment has also not included the large reliability benefits, which means it is very conservative.

3.6.5 A simple multiple variable test was also undertaken assuming a decrease in time benefits caused by a reduction in demand with a proportional impact in user charges and revenues. This test allows the adjustment of the three variables to reflect the percentage change that would be needed to reduce the NPV (initial) from £976m to £500m (over 60 years).

3.6.6 Under these assumptions user time benefits, user charges and revenues would each have to be reduced by 20% at the same time to result in a reduced NPV of £500m. (User time benefits from £2,096m to £1,677m, user charges from £1,119m to £895m and revenue from £1,401m to £1,120m)

3.6.7 Another test has used the London Value of Time. The main analysis of the report is based on standard National Value of Time recommended in TAG. However the TfL Business Case Development Manual recommends use of a higher London Value of Time. To indicate the potential impact pending full modelling of this, simple VoT uplift factors of 39.1% and 29.3% have been applied to the travel time benefit calculation for users, with all other assumptions remaining the same. (Further work will be undertaken on the modelling of this sensitivity test). The results are shown below.

3.6.8 These indicate a very significant increase in net user benefits of some £705m for the initial and £800m for the adjusted estimates.

Table 3.15: Net user benefits – National vs London VoT, £m, PV, 2010 prices

	Others users			**Business users**				**Total**
	Car commuting	**Car other**	**Bus & coach**	**Cars**	**LGV**	**HGV**	**bus & coach**	
National VoT								
Total user benefits	£161	£349	£650	£578	£291	£ 99	£60	£ 2,188
Total Net user benefit	£11	£71	£650	£ 447	-£40	-£130	£60	£1,069
% Total Net user benefits	1%	7%	61%	42%	-4%	-12%	6%	100%
London VoT								
Total user benefits	£204	£445	£841	£795	£398	£126	£83	£2,893
Total Net user benefit	£54	£167	£841	£663	£68	-£102	£83	£1,774
% Total Net user benefits	3%	9%	47%	37%	4%	-6%	5%	100%
National VoT (with reliability benefits)								
Total user benefits	£194	£432	£650	£670	£357	£122	£60	£2,485
Total Net user benefit	£44	£153	£650	£539	£26	-£107	£60	£1,367
% Total Net user benefits	3%	11%	48%	39%	2%	-8%	4%	100%
London VoT (with reliability benefits)								
Total user benefits	£247	£552	£841	£923	£490	£159	£83	£3,295
Total Net user benefit	£97	£273	£841	£792	£160	-£70	£83	£2,176
% Total Net user benefits	4%	13%	39%	36%	7%	-3%	4%	100%

3.6.9 A number of economic sensitivity tests have been undertaken. One test is to determine the percentage change in key factors (individually) that would be needed to reduce the NPV (initial) from £928m to £500m (over 60 years). This indicated that:

- user benefits would need to decrease from £620m (current) to £192m- a 69% reduction;
- investment costs would need to increase from £553m (current) to £981m i.e. a 77% increase; and
- revenue would need to decrease from £1,859m to £1,431m i.e. a 23% reduction. (We note that revenue has a more complex effect on the economic outcomes, but this gives some indication of impact).

3.6.10 Clearly this assessment is simplistic, as one or more factors could vary in conjunction with each other, but it indicates that significant changes are required in these key variables while the Scheme still provides a large positive economic benefit. This assessment has not included the reliability benefits, which means it is very conservative.

3.6.11 Another test has used the London Value of Time. The main analysis of the report is based on the standard National Value of Time, however, TfL's Business Case Development Manual recommends use of a higher London Value of Time. This requires uplift factors of 39.1% and 29.3% to be applied to business and commuters/ other users in the appraisal as a second sensitivity. This test shows that under these assumptions there would be a very significant increase in net user benefits of some £600m for the initial and £700m for the adjusted estimates.

3.7 Distributional analysis

3.7.1 The benefits and disbenefits of the Silvertown Tunnel scheme may be experienced to different extents by different specific social groups. These may include: children, older people, people with a disability, Black, Asian and Minority Ethnic (BAME) communities, people without access to a car and people on low incomes. It is important to make sure that people who belong to vulnerable groups are not disadvantaged further by receiving a disproportionately low share of the scheme benefits, or a disproportionately high share of the scheme disbenefits.

3.7.2 The distributional impacts appraisal compares the distribution of scheme benefits against the distributions of specific social group populations to assess the extent to which scheme benefits are experienced by those groups compared with the general population. This assessment has been

prepared in accordance with the Department for Transport (DfT) TAG guidance (unit A4.2).

There are eight transport benefit indicators that are assessed in the distributional impact appraisal - these are set out in

Table 3.10. The geographic distribution of the indicators has been compared with the geographic distribution of concentrations of groups that may be particularly susceptible to the positive or negative impacts, with the outputs summarised in the

3.7.3 Table 3.10.

Table 3.10 Results of Distributional Analysis

Indicator	Assessment	Conclusion
User benefits	Overall net user benefits of £14.2m (initial assessment) and £16.2m (including reliability benefits in 2021 (2010 prices). The impact is strong beneficial for low income users and slight beneficial for medium-high income users.	Moderate beneficial
Noise	An initial assessment indicates that reductions in noise levels would particularly benefit children and people in the most income-deprived areas, while less income-deprived areas may experience an increase or no change,	Moderate beneficial
Air quality	An initial assessment indicates that improvements in air quality would particularly benefit children and people in the most income-deprived areas. People in other areas would experience beneficial or neutral air quality impacts	Moderate beneficial
Accidents	There would be a reduction in overall accident numbers within the impact area. For most vulnerable groups the impacts are scored as moderate or large beneficial.	Moderate beneficial
Security	Initial screening indicated that the Scheme would have no material impacts on security.	N/A
Severance	High concentrations of vulnerable groups on minor roads with decreases in vehicle flow would enhance the small positive impacts for those groups.	Slight beneficial

Indicator	Assessment	Conclusion
Accessibility	Accessibility impacts are scored as beneficial for all assessments. The impact area contains a high proportion of non-car-owning households.	Moderate beneficial
Personal Affordability	User charges would have a slight adverse impact on people on low incomes and mainly impact people on higher incomes. Benefits from public transport modes would mainly benefit people on low incomes. This does not take into account the monetary value of time savings and reliability, which the user benefit estimate above shows are greater than the level of user charges.	Neutral

3.8 Social Analysis

3.8.1 The Scheme, like all transport interventions, would have social impacts upon travellers using the crossings and people living or working in its vicinity. The purpose of the Social Impact Assessment is to evaluate, and in some cases quantify, these impacts in order that they can be considered relative to other outcomes.

3.8.2 The Social Impacts Appraisal covers social factors that are not already considered as part of economic or environmental impacts, as set out in Table 3.11, and prepared in line with Department for Transport (DfT) TAG guidance (unit A4.1). The table highlights the main conclusions from the assessment based on a seven-point scale of beneficial, neutral or adverse.

Table 3.11 Results of Social Analysis

Indicator	Assessment	Conclusion
Accidents	There would be a slight reduction in accidents due to the Scheme.	Slight beneficial
Physical activity	No provision for active modes is included in the Scheme reference tunnel design. A small mode shift from car to PT would lead to a small increase in physical activity	Slight beneficial
Security	The Silvertown Tunnel is not expected to have a material impact on security to road users.	Neutral
Severance	There is a neutral impact on the existing severance issues identified.	Neutral
Journey quality	Improvements in reliability and reduction in congestion are expected to reduce driver stress.	Large beneficial

Indicator	Assessment	Conclusion
Option values and non-use values	Two new bus routes and four enhanced bus routes are likely to be introduced, with 12,000 households situated within 100m of the route alignments.	Moderate beneficial
Accessibility	Positive net impact on public transport accessibility as a result of improved resilience and reliability and enhanced services.	Moderate beneficial
Personal affordability	The Scheme would result in increases to car user charges, mainly affecting people on medium or high incomes. Some public transport users may benefit from new bus services that offer cheaper options than are currently available, particularly lower income groups. The monetary value of time savings, which (including reliability) are greater than the user charges, are not included in this assessment.	Neutral

3.9 Wider Impacts

3.9.1 Wider Impacts (WI) are the economic impacts of transport that are additional to transport user benefits. Transport schemes are likely to have impacts not only in the transport market but also in the labour, product and land markets. For instance, one of the objectives for the Silvertown Tunnel is to support growth in east and south-east London by providing improved cross-river transport links for business and services (including public transport). If the levels of local congestion at the Blackwall Tunnel are reduced, and reliability and resilience greatly improved, there are likely to be wider benefits for a large area.

3.9.2 The technical note on WI (Appendix G of the EAR) explains the methodology followed to estimate Wider Impacts for the Scheme - the calculations have followed the guidance in TAG Unit A2.1 (January 2014). The following are the types of Wider Impacts that were considered:

3.9.3 WI1- Agglomeration: firms derive productivity benefits from being close to one another and from being located in large labour markets. These impacts appraise the effect of implementing a transport scheme that brings firms closer together and closer to their workforce. For example increased productivity due to access to larger product, input and labour markets and knowledge and technology spill-overs. Agglomeration is a function of the proximity of businesses to one another and to workers and the calculations use changes in generalised cost as an indicator of distance. Agglomeration is a function of the proximity of businesses to one another and to workers and the calculations use changes in effective

density, which in turn depends on generalised cost changes combined with estimates of density and productivity by economic sector.

3.9.4 WI2- Output change in imperfectly competitive markets: standard transport appraisal takes into account the time savings for business, and when this occurs output is also expected to increase. For example, the same delivery person could make more deliveries in one day and similar situations would happen benefits would accrue to other industries. Also, because there are imperfectly competitive markets, companies are capable of selling products at a higher price than the cost of producing it; this difference is known as the price-cost margin. When companies benefit from time savings due to a transport scheme, it is effectively a reduction in their production costs, this puts in place an incentive to increase the output while still keeping an attractive price-cost margin. This additional output increases the welfare obtained by consumers and WI2 values this change. This was calculated (as per the guidance) as equivalent to 10% (imperfect competition up-rate factor) of the total user impacts to business journeys. This includes time benefits, user charges, vehicle operating costs and reliability benefits considering only buses and cars. Freight was defined as LGVs and HGVs.

3.9.5 WI3- Tax revenues arising from labour market impacts: people make commuting decisions based on their income after taxes. Therefore, the value of time used for time savings doesn't include exchequer benefits that happen in practice when people make different decisions about employment as a result of a transport scheme. There are two ways in which the labour market can be affected:

- WI3.1 Labour supply impacts: estimates the effect on taxes due to a change in the number of people attracted into work as a result of an improvement in travel costs. The formula applied measured how the change in round-trip commuting average generalised costs, between both scenarios, interacts with other variables to estimate the new quantity of workers in the market, and the effect of this on GDP.
- WI3.2 Moves to more or less productive jobs: estimates the effect on taxes of an overall change in employment due to the decisions of people and businesses of moving between locations with different productivity levels due to a transport scheme. The information on residential and employment location provided by a land use transport interaction model is required, but was not available for this submission; therefore these impacts have not been estimated at this time.

3.9.6 A summary of the estimated Wider Impacts is shown in Table 3.12.

Table 3.12 Summary of Wider Impacts Estimates (£m, 2010 prices)

Wider Impact	2021 (£m)*	2031 (£m)*	Appraisal Period 2021-2080 (£m)*	Net Present Value (£m)**
WI1- Agglomeration	1.2	1.6	153.2	37.9
WI2- Output Change in imperfectly competitive markets	1.5	2.5	250.9	60.1
WI3- Taxes arising from Labour Supply impacts	0.14	0.29	27.3	6.6
Total Wider Impacts	**2.84**	**4.39**	**431.4**	**104.6**

3.10 Regeneration

3.10.1 The Silvertown Tunnel Regeneration Report (TfL, September, 2015) notes that London is a significant driver of the UK economy and creates the wealth and taxes that pay for a significant proportion of much of the country's public infrastructure and services. For London to continue to be a significant contributor to the UK's economy it needs to be able to compete with other major international centres and grow. Indeed London's population is predicted to grow by two million people over the next two decades, becoming a city of over ten million people by 2031. East London is vital to facilitating that growth, as it has the largest physical capacity for development in the south-east, and is one of the largest regeneration areas in the UK.

3.10.2 To ensure that this growth can be delivered, the right supporting infrastructure needs to be put in place. This is recognised in the Further Alterations to the London Plan, which identifies Silvertown as one of a package of schemes required to support population and employment growth in east London and thereby support London's economy as a whole.

3.10.3 However, many parts of the east London economy are not yet achieving their full potential. While Gross Value Added (GVA) per worker has grown between 2004-2013 by 43% in inner London, the comparable figures for

east and north-east outer London is just 13% and 16% in outer south London. This compares to the average UK figure of 27%. Over the last 20 years regeneration has transformed much of the former London Docklands and parts of the Thames Gateway and many previously derelict sites now have successful new uses, both commercial and residential, particularly those in inner London boroughs. This has been accompanied by a diversification of the economic base and a substantial increase in employment in the area, supported by investment in road and rail infrastructure. But there remains significant latent potential to be unlocked across much of east London.

3.10.4 The London Plan identifies areas of regeneration based on Lower Super Output areas (LSOAs) within the 20% most deprived nationally, as defined by the Index of Multiple Deprivation. These are heavily concentrated to the north of the river (much of the London boroughs of Tower Hamlets and Newham) but there are also pockets of deprivation to the south as well, with significant areas in the Royal Borough of Greenwich. The proposed tunnel links areas of deprivation on both sides of the river.

3.10.5 TfL has invested heavily in public transport in the area. However, apart from the substantial investments in the early 1990's to support the regeneration of London Docklands, the road network has not seen similar investment and is severely constrained, with a consequent ‘barrier effect’ of the river Thames and the limited number of road crossings across it, all of which are subject to significant congestion and reliability problems, with the Blackwall Tunnel being the most significant of these. These include high levels of congestion leading to long journey times and unreliability due to incidences such as over height vehicles and a lack of alternative crossings.

3.10.6 These transport problems lead to increased business costs, reduced labour market and customer catchment areas and constraints on development.

3.10.7 There is a large and generally consistent literature explaining the link between transport and economic development. These links can be broadly related to business efficiency, the labour market and land use/development. Improving accessibility and reducing congestion reduces journey times and the variability in journey times. These in turn lead to reduced costs and larger catchment areas for markets and suppliers, increasing competition and thereby further driving down costs and raising innovation. Larger labour catchment areas improve access to specialist skills as well as offering the opportunity to increase competition

for jobs and reduce costs. For potential employees it offers more job opportunities and career prospects leading to increased productivity. Improved accessibility and often equally important, an improved perception of an area increases its attractiveness for people and businesses. This leads to increased land values which drives higher investment and densification of development.

3.10.8 London's strategic priority is to significantly increase the delivery of housing compared to current levels. The rapid increase in house prices, resulting from supply failing to keep up with demand, is resulting in worsening problems of overcrowding and restricting labour supply. Business leaders are increasingly citing the lack of housing as a key constraint.

3.10.9 When cross-river highway traffic in the single greatest concentration of developable land in the UK's most productive city is subject to diversions, delays and unreliability it can only serve to impede short-run economic output and inhibit the attractiveness of the area and sustainable future growth. Tangible impacts in the efficiency of the local economy and improved access to jobs and services are likely to improve the attractiveness of the area, which could potentially support future levels of development, including housing, as a result of the Scheme.

3.11 Appraisal Summary Table

3.11.1 The Appraisal Summary table (AST) summarises all of the quantitative and qualitative information in the Outline Business Case, and is included in Appendix A. The main conclusions from this are:

- Economy – significant time benefits (£965m) and vehicle operating cost benefits (£68m) to business users offset by charges and delays during construction, resulting in an overall net benefit of £337m. Additional high reliability benefits for business users (£182m) giving an overall net benefit to business users of £519m. The Scheme would also contribute to development (housing and employment) in one of London's; most deprived regeneration areas.
- Environment – there is slight adverse impact on air quality (-0.27m) and noise (-£2.7m). However Greenhouse Gases emission is slight beneficial (£12.1m), resulting in a net environmental benefit of £9.1m.
- Social - overall beneficial impacts. Commuting and 'other' users benefit significantly from the provision of Silvertown Tunnel through reduced travel time (including reductions in congestion) and vehicle operating

costs amounting to £1,131m and £36m respectively, but experience £6m delays due to construction, giving an overall time benefit of £1,1610m. The introduction of a road user charge would be a disbenefit to users of £428m, giving an overall net benefit of £732m. There will also be additional reliability benefits of £116m to these travellers. These travellers would also benefit in terms of journey quality and accident reductions, and residents in relation to severance and access to services, public transport, air quality and noise. A neutral effect is expected on low income groups in relation to Scheme personal affordability.

- Public Accounts: the Scheme is expected to deliver a net benefit to the public accounts of some £5m, offset by a loss of some £143m in indirect taxation.

3.12 Value for money statement

3.12.1 This section summarises the Value for Money conclusions – reference should also be made to the AST in Appendix A and as described above.

3.12.2 The sections above describe the outcome of the non-monetary assessments (the social, distributional and environmental analyses) – no significant negative impacts were identified, and many impacts were beneficial. There is slight adverse impact on air quality (NO_x and PM10) and noise but net benefits in carbon emissions. The VFM category of the scheme is regarded as high, as it is expected to have an NPV exceeding £928m, and to have a positive impact on the public finances.

3.12.3 Sensitivity testing indicates that even with significant changes to key variables, it is likely that the scheme would still have a high NPV.

4. THE FINANCIAL CASE

4.1 Introduction

4.1.1 The Financial Case sets out the project and ongoing operating costs and financing and funding arrangements to deliver the scheme.

4.2 Project costs

4.2.1 The project currently has an Estimated Final Cost (EFC) of £792m (outturn price, including risk and inflation). The EFC comprises of £90m for TfL's delivery costs, including planning, procurement, land acquisition, project management and £702m for contractor design and construction costs. Total discounted costs are estimated to be around £553m (in 2010 market price value)

4.2.2 Operating costs for the collection of the road user charge have been provided by TfL. These costs include elements such as transactional charge costs, and monthly maintenance costs for the Automatic Number Plate Recognition (ANPR) cameras. The Silvertown Tunnel charge collection operating costs are based on the traffic flows. Traffic flows for intermediate years between 2021, 2031 and 2041 have been interpolated on a straight-line basis, between the values for the three model forecast years (2021, 2031 and 2041). Charge collection costs beyond 2041 to 2080 have been assumed at the 2041 value.

4.2.3 Operating costs have also been provided by TfL. These costs were converted to 2010 prices, adjusted for indirect taxation and discounted over 60 years. The total discounted cost associated with user charge collection is about £436m (2010 prices).

4.2.4 Maintenance costs have been estimated by TfL to allow for routine tunnel maintenance, reactive tunnel maintenance, and tunnel services (electricity and water) for the appraisal period. Both the routine and reactive tunnel maintenance comprises elements for maintenance of the road infrastructure and for the traffic control equipment. These costs are estimated at £101m (2010 price discounted to 2010).

4.3 Financing

4.3.1 TfL proposes to use a Public-Private-Partnership (PPP) contract for the Silvertown Tunnel project. The project has characteristics which make it a suitable candidate for delivery via a privately financed solution:

- The physical structures are unlikely to be subject to significant change and technical advancements over the asset life.
- The interface risks with other assets or services are limited, predominately to the junctions at either end.
- The value of the scheme is large enough to attract interest from the markets.
- Road and tunnel risks are well understood by financing markets which should ensure a competitive cost of capital.

4.3.2 Although the use of PPP may mean that the financing cost of the scheme is greater than if TfL finances the scheme itself, the use of a privately financed solution has a number of key advantages:

- Risk is effectively transferred to the party who is best placed to manage it, improving value for money.
- Total costs are minimised as the private sector can take advantage of whole life costing as they are responsible for the design, construction and ongoing maintenance of the asset.
- There is greater opportunity for the private sector to reduce cost through innovation as the performance standards of the tunnel are specified, rather than the design or construction method.
- Services are focused on end user satisfaction through performance based payments.

4.3.3 There are also advantages for TfL in that the payment of scheme costs is deferred until the scheme is operational, which allows TfL to invest in other schemes, which may not be suitable candidates for a privately financed solution. Repayment of private finance can also be spread out over time, allowing TfL to use revenues generated from user charging to contribute to the cost of the tunnel.

4.4 Funding

4.4.1 A PPP contract would see the private sector take on the responsibilities for design, construction, finance and maintenance risks of the project, in return for a series of payments by TfL made from the date of opening the tunnel for 25 to 30 years. The payments to the private sector would be made from TfL's general funds.

4.4.2 As part of the project, it is proposed that road user charging is introduced on both Blackwall and Silvertown tunnels to help manage the traffic demand at both crossings and to help raise money to pay for the construction and operation of the new tunnel. TfL expects that revenue collected would over time cover the cost of the scheme and may also play a part in funding other future transport investment in east London.

5. THE COMMERCIAL CASE

5.1 Introduction

5.1.1 This section of the paper provides details on the commercial structure and procurement approach of the project.

5.2 Proposed commercial structure

5.2.1 TfL is proposing to deliver Silvertown Tunnel by entering into a PPP contract with a private sector party who would be responsible for the detailed design, construction financing and on-going maintenance of the new tunnel for around 30 years. At the end of the contract the asset would be handed back to TfL.

5.2.2 TfL would make regular payments to the private sector party once the tunnel was operational. Deductions would be made from these payments to the extent that the private sector party fails to meet the specified availability, performance and safety requirements. TfL would control the day to day operation (e.g. traffic management) of Silvertown Tunnel. The Blackwall Tunnel would continue to fall under existing operations and maintenance arrangements.

5.2.3 TfL would be responsible for setting and collecting the user charges on both Silvertown and Blackwall Tunnels. Within this structure, there is flexibility over the delivery and operation of the user charging system. This could either be integrated into the existing congestion charge system or procured as a separate collection contract.

5.2.4 Other commercial models such as Design Build Finance Transfer and Regulatory structures have been considered, but are not suitable as they have significant drawbacks in terms of affordability and value for money.

5.3 Risk transfer, payment mechanisms, pricing framework and charging mechanisms

5.3.1 The risk allocation approach is to pass over risks that the private sector can control or manage therefore being able to price with confidence. This approach helps to achieve value for money as certain private sector organisations have more experience and are therefore better equipped to manage and mitigate certain risks. TfL plans to transfer construction, financing and maintenance risk to the private sector party.

5.3.2 The payment mechanism would determine how payments to the private sector party are calculated and is fundamental to the contract by putting

into financial effect the allocation of risk and responsibilities between TfL and the private sector party.

5.3.3 TfL are proposing to adopt an availability based structure where payments are based on the level of asset availability for use. Deductions are applied where the crossing is not available in full or in part. There is a strong appetite amongst both debt and equity investors for availability based road structures and strong competition between bidders can be expected. Recent examples include; the M25, the Mersey Gateway Bridge, the Scottish roads programme (M8, AWPR, M80), the Dutch / German / Norway / Irish roads programmes and recent Australian and Canadian road schemes;

5.3.4 Usage and shadow toll payments arrangements have been ruled out. Under current HMT policy on use of public private partnerships (now termed PF2 by the UK government), the presumption is that authorities do not transfer usage risk unless there is a clear rationale for doing so. In the case of the Silvertown Tunnel project, usage risk would be difficult for the private sector to price efficiently given the complexity predicting the behaviour of traffic on the surrounding network, the impact that other future transport investments might have and their ability to predict usage levels over time, even if given control of user charging pricing. This therefore makes both shadow toll and real toll payment structures unsuitable as the primary payment mechanism.

5.4 Procurement route

5.4.1 A Design Build Finance and Maintain (DBFM) contract for Silvertown Tunnel and any ancillary contracts, such as the user charging collection system, would need to be competitively tendered via EU compliant means in the Official Journal of the European Union (OJEU). It is currently being assumed that either a competitive dialogue or negotiated procedure would be adopted to allow bidders to develop alternative proposals to meet TfL's requirements. This would encourage innovation as well as maintain competitive pressure during the bidding process. The Financial Case sets out the project and ongoing operating costs, financing and funding arrangements to deliver the scheme and the accounting treatment.

6. THE MANAGEMENT CASE

6.1 Introduction

6.1.1 The purpose of the Management Case is to assess whether a proposal is deliverable. It reviews evidence from similar projects, sets out the project planning, governance structure, risk management, communications and stakeholder management, benefits realisation and assurance.

6.2 Evidence of similar projects

6.2.1 TfL has extensive experience in developing, promoting and delivering significant infrastructure projects. These range from minor modifications to existing infrastructure such as improving junction layouts (for example at Tottenham Hale, Euston Circus and Elephant & Castle) and public realm improvements (for example Trafalgar Square and Oxford Circus) to major schemes.

6.2.2 Major schemes developed, promoted and delivered by TfL in recent years include the Jubilee Line Extension, a major programme of extensions to the DLR, the London Overground Network, the Emirates Air Line and Crossrail, the refurbishment of Hammersmith Flyover, and the network of cycle super highways. These projects have been progressed through the planning system using a range of routes including Transport and Works Act Orders (TWAO), the Private Member's or Hybrid Bill Process and powers under the Highways Act.

6.2.3 There is considerable experience with major highway projects in London but none with tolled road tunnels, although TfL has extensive experience of user charging with the Central London Congestion Charge. Furthermore, the Development Consent Order (DCO) process that would be used for the Silvertown Tunnel is relatively new. While much of TfL's project development experience would be transferrable to this scheme, TfL would seek additional support and advice from experienced promoters of major highways and infrastructure schemes and operators of similar projects. These include Highways England schemes, Thames Tideway Tunnel, the Mersey Gateway Bridge and the operators of the Mersey and Tyne Tunnels, the only existing examples of tolled urban tunnels in the UK.

6.3 Programme linkages

6.3.1 The east London River Crossings Programme is exploring the impacts and benefits of proposals for new river crossings in east London, including options for the Woolwich Ferry service, whose current operating contract

expires in spring 2020. Options include replacing the ferry and associated infrastructure at Woolwich, introducing a new ferry service at Gallions Reach; bridge options at Gallions Reach and Belvedere are also being explored.

6.4 Key project assumptions

6.4.1 TfL would deliver the project via a Public Private Partnership (PPP), whereby a private sector organisation would complete the detailed design, build the tunnel and supporting infrastructure and be responsible for maintenance during a 30 year concession period. The DBFM structure would best meet the project objectives and constraints, and achieve an appropriate risk balance. A DBFM contract would be competitively tendered in accordance with EU procurement procedures.

6.4.2 TfL would pay back the DBFM organisation by means of a monthly unitary charge based on an availability mechanism over the 30 year concession.

6.4.3 TfL would rely on a user charging regime for Silvertown and Blackwall Tunnels as a means of contributing to funding the unitary charge and managing traffic demand.

6.4.4 Funding for the non-PPP elements of the project would be funded by TfL's investment programme. This would include components such as the project management, procurement, the planning and consents process, legal, technical and financial advisers and the acquisition of temporary and permanent land.

6.4.5 The land for the proposed route has been safeguarded since 1990. Continued safeguarding of the route has been identified as an external dependency for the delivery of the Silvertown Tunnel.

6.5 Governance, organisational structure and roles

Internal governance

6.5.1 The Silvertown Tunnel project is sponsored by the Director of Asset Management, within Surface Transport with a lead sponsor embedded in the integrated project team.

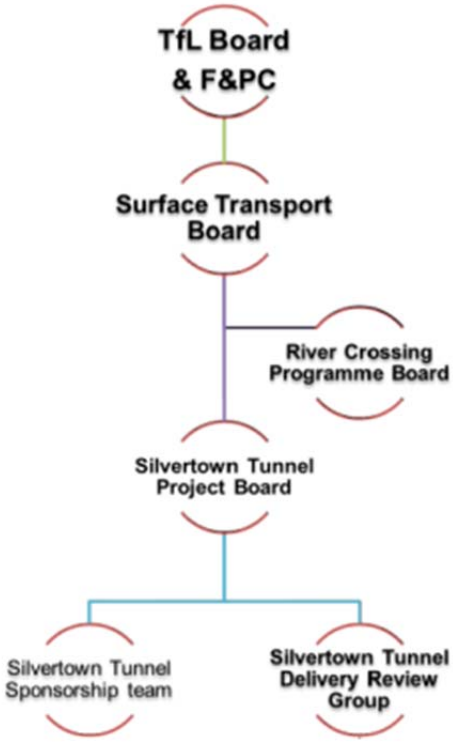
6.5.2 The project is overseen by a dedicated Project Board which comprises as lead members; the Director of Asset Management, the Director of Projects and Programmes, the Director of Surface Finance, and the Managing Director of Planning. Project Board meetings are held every four weeks.

6.5.3 The project is led by a dedicated Project Director, who has overall accountability for the delivery of the project to the time, cost and quality parameters established by the Sponsor. The Project Director reports to the Director of Projects and Programmes, the delivery arm of Surface Transport.

6.5.4 The Project Director is supported by a project delivery team comprising three principal work streams; DCO, Commercial, and Project Management. A Delivery Review Group formed of work stream leads and other senior managers provides day to day management of each work stream. The Delivery Review Group meets weekly and reports to the Project Board on a regular basis.

6.5.5 The project operates under the TfL Standing Orders for governance and delegated powers of authority, requiring financial, project and procurement authority to be obtained at each stage in the project lifecycle appropriate to the value of the authority being sought.

Figure 6-1 Silvertown Tunnel Project Governance Structure



6.6 Independent peer review group

6.6.1 An Independent Peer Review Group (IPRG) was established in November 2013 to provide independent expert scrutiny of the Silvertown Tunnel project, initially regarding the selection of a preferred tunnel option and to review the proposed ground investigation works. The IPRG comprises

leading industry experts in tunnelling design and construction and is established under the auspices of the Institution of Civil Engineers (ICE).

6.6.2 The IPRG meets on an ad hoc basis and the project team provides updates and takes advice to inform the development of the project as appropriate. It would remain in place to undertake reviews on technical and engineering matters at key stages during the design, procurement and delivery of the project.

6.7 Tunnel safety design and consultation group

6.7.1 The establishment of a Tunnel Safety Design and Consultation Group (TDSCG) is acknowledged as good practice and a London-wide TDSCG is already established and managed by TfL. The Silvertown Tunnel TDSCG was established in early 2014 to provide input to the tunnel design and operational strategy and have recently concluded their input into the reference design.

6.7.2 The TDSCG is chaired by the Tunnel Safety Officer (TSO) and attended by representatives of the relevant safety and operational bodies that would respond in the event of an incident. The involvement and input to the reference design is comprehensively summarised in the draft 'TDSCG Consultation Document - Reference Design', which includes written agreement with the emergency services and other parties on a number of key issues.

6.7.3 The Silvertown Tunnel TDSCG meets on an ad-hoc basis and provides valuable input and advice to the development of the development of the tunnel design.

6.8 Programme/project plan

6.8.1 Some key future milestones for the project are shown in Table 6.1.

Table 6.1 Project Milestones

Milestone description	Date
Statutory consultation	5 October to 27 November 2015
DCO submission	March 2016
Procurement process launched	April 2016
DCO examination period	April 2016 – February 2017
Secretary of State decision	Summer 2017

Milestone description	Date
Contract award	Summer 2018
of construction	Autumn 2018
End of construction	Summer 2022

6.9 Project team organisation and work streams

Sponsor work stream

6.9.1 The Sponsorship team is managed by the Lead Sponsor, who ensures that the project delivers the benefits and requirements identified at the early stage of the project lifecycle. This would be achieved through the following sub-work streams:

- requirements and benefits;
- business case;
- governance and assurance;
- stakeholder engagement; and
- lessons learned

DCO work stream

6.9.2 The DCO (Development Consent Order) team is managed by a project manager who has oversight of the DCO application process. Within the DCO team there would be a number of sub-work streams which focus on the different core aspects of the application. These would be:

- transport modelling;
- transport planning;
- environment;
- engineering design;
- consents;
- legal;
- business case;

- consultation; and
- land assembly

Commercial work stream

6.9.3 The Commercial Team is managed by a Head of Commercial overseeing the activity allocated to the following separate sub-work streams:

- commercial strategy and preparation of contracts for all procurements, including leading on contract negotiation and providing commercial direction for the land assembly team;
- technical support services;
- project funding and financing including user charge revenue, gap funding, cost plan and private finance;
- procurement strategy and process, and responsibility for assembling the tender documentation and managing the tender evaluation; and
- periodic financial administration.

6.10 Project management and administration

6.10.1 The project management team is managed by a PPD programme manager and is made up of project manager(s), assistant project managers and a project support officer. In addition, the project team has access to further staff resources to cover the planning and reporting functions. The team would cover a number of key project management sub-work streams:

- risks, issues and assumptions;
- change control;
- financial control;
- reporting;
- lessons learnt;
- contract management;
- document management; and
- planning and performance monitoring.

6.11 Assurance and approvals plan

6.11.1 The assurance and approvals process would follow TfL's established project assurance procedures which include assurance at three levels: internal, Programme Management Office (PMO) and external. An Integrated Approvals and Assurance Plan (IAAP) exists for the project which maps out the assurance and approvals required throughout the lifecycle of the project.

6.11.2 Internal assurance is provided through Pathway (TfL's project management methodology) project stage gates and/or peer reviews staffed by the sponsor and delivery personnel either from within the project or from a peer project. Underlying these stage gates are a number of assurance activities conducted by both TfL and the suppliers and include activities such as design reviews, safety assessments, risk reviews, commercial assessments, estimate validation, material testing, site inspections and product testing.

6.11.3 The number and timing of the stage gates are established by the delivery organisation, based on guidance in Pathway, and informed by a characterisation tool that considers such things as scale, complexity, novelty, project team experience and the strategic importance of the project. A number of Products are required to be completed to provide evidence at the stage gate that the project is fit to proceed to the next stage.

6.11.4 Products are outputs that are signed off by authorised individuals, and include such documents as project execution plans, risk management plans, project estimates and design compliance certificates.

6.11.5 The PMO is part of TfL but is not accountable for delivery. These reviews are typically Integrated Assurance Reviews (IAR), staffed by a combination of PMO staff, consultant external experts (EE) or peer groups from outside the delivery organisation.

6.11.6 The EEs are selected on the basis of their relevant experience and suitability to the project under review. Each review is covered by a Terms of Reference that sets the scope and the brief to the EE, who is procured from a TfL consultancy framework. The Terms of Reference is based on the Pathway IAR Lines of Enquiry, aimed at generating a comprehensive review. Each Line of Enquiry includes up to 20 detailed challenges, devised to match the maturity of the project at its particular point in its lifecycle.

6.11.7 The Lines of Enquiry were developed as part of the Corporate Gateway Approval Process (CGAP) in 2008, following a comprehensive benchmarking process that assessed the assurance regimes in other organisations and the Office of Government Commerce (OGC) who produced gateway processes and guidance (now part of the Cabinet Office). Some additions have been made since 2008, including more explicit challenges covering cost benchmarking.

6.11.8 The IAR report is considered by appropriate bodies prior to seeking authorisation. IARs are conducted at key stages of the project:

- initiation;
- option selection;
- pre-tender;
- contract award;
- project close out;
- benefits delivery; and
- annual review (where no other IAR would happen within 12 months).

6.11.9 The involvement of the Independent Investment Plan Assurance Group (IIPAG), which has been appointed to provide independent assurance and advice to the Mayor, is determined on both a risk based approach and a project value threshold. The IIPAG reviews are normally commissioned on projects with a value of £50m or more. The IAR process is as detailed above and the IIPAG then attends the Gate Review Meeting once the EE Interim Report has been produced. The IIPAG then produces its own reports, which are submitted at the relevant approval meetings alongside the PMO Report, based on its review of the IAR material and discussions at the final Gate Review Meeting.

6.11.10 The Sponsor Team is responsible for keeping internal stakeholders appropriately engaged and informed. In accordance, formal, minuted meetings with set agenda and actions have been arranged with all internal stakeholders.

6.12 External stakeholders

6.12.1 The Sponsor Team is also responsible for engagement with external stakeholders and a stakeholder team is embedded in the project to undertake this engagement. A Stakeholder Engagement Strategy and

Communications Plan have been prepared for the project and provides a brief on the objectives of the stakeholder engagement, target audience and methodology.

6.12.2 The external stakeholders identified are summarised below:

- boroughs;
- political stakeholders;
- statutory stakeholders;
- representative organisations (businesses, freight interests, motorists and public transport users);
- residents; and
- businesses

6.12.3 A database of all contacts, topics of discussion, responses made and any commitments entered into has been set up and is routinely maintained and kept up to date.

6.12.4 Engagement meetings and briefings with all key stakeholder groups have been established and would continue throughout the lifecycle of the project.

6.13 Consents

6.13.1 A Consents Strategy has been prepared which identifies the statutory stakeholders and the plan for obtaining the necessary consents that fall outside the remit of the DCO.

6.14 Project controls and reporting

6.14.1 TfL would develop project controls supported by robust reporting processes that align with the Projects and Programmes Directorate's project governance framework, integrating key stakeholder requirements, facilitating continuous monitoring, and incorporating accurate performance measurement. The purpose is to provide accurate project information in a timely way to ensure well informed decisions are made and appropriate action is taken.

6.14.2 Typical examples of project controls products include:

- risk registers;

- project schedules;
- cost plans, estimates and forecasts;
- lessons learned logs;
- change control logs;
- resource plans; and
- reporting.

6.14.3 The project would be managed under and comply with Pathway, which is designed to deliver a robust reporting regime, including:

- governance meetings which form part of the reporting process as the forum where performance issues are raised, possible mitigation is discussed and key decisions required are made; and
- project reporting requirements which include the periodic reporting of progress, the management of risks and issues, financial performance and achievement of milestones. The reporting requirements are fully defined, together with content requirements, target audience and timing.

6.14.4 Compliance with the Pathway methodology is regularly audited and is subject to the assurance reviews mentioned above.

6.15 Document management

6.15.1 The project uses TfL's comprehensive information systems, including the TfL Document Manager (Livelink) and SharePoint. An integrated electronic document management system would be implemented for the creation, repository, tracking, unique numbering, version control and workflow auditing of all project related documentation.

7. CONCLUSION

7.1 Recommendation

7.1.1 The recommendation of the Outline Business Case is that the Scheme be progressed through the DCO process. The responses to the five key questions raised in the guidance can be summarised as follows:

7.1.2 There is a clear and robust case for change for a new tunnel at Silvertown, to address current congestion, closures and resilience and to support the needs of future economic growth. This ‘strategic case’ is closely related to national, London-wide and local road policy objectives, with a particular reference to the London Plan and the Mayor’s Transport Strategy.

7.1.3 The project is expected to achieve the specific objectives set out for it, and the policy requirements of the NPS – the Case for the Scheme provides a detailed summary of each objective or policy requirement and how the Scheme achieves these.

7.1.4 The analysis demonstrates that the scheme is excellent value for money – it has a high net present value (at least £928m) and is a scheme that can be delivered and funded primarily by user charges.

7.1.5 The scheme is commercially viable – the report sets out the procurement, commercial structure, and proposed allocation of risk and payment mechanisms for the project.

7.1.6 The scheme is financially affordable – the ‘financial case’; the analysis sets out the project cost, describes the private funding mechanism available to deliver the scheme and the proposed financing arrangements including the accounting treatment.

7.1.7 The project is achievable- the ‘management case’ sets out a clear governance, process and programme for the further development of the scheme by TfL, an authority with a very successful experience and record in major project delivery.

APPENDIX A APPRAISAL SUMMARY TABLE

Table 3.17

Date produced:	26 August 2015

Contact:	
Name	Jason Saldanha
Organisation	TfL
Role	Project Manager

Name of scheme:	River Crossings Package: Silvertown Tunnel
Description of scheme:	The scheme involves the construction of a new tunnel between the Greenwich Peninsula and Silvertown, with tunnel approaches linking to the existing road network an the implementation of user charging at both the new infrastructure and the existing Blackwall Tunnel.

Impacts		Summary of key impacts	Assessment: Quantitative			Qualitative	Monetary £(PV)	Distributional 7-pt scale/ vulnerable grp
Economy	Business users & transport providers	Business users benefit significantly from the provision of Silvertown Tunnel through reduced travel time (including reductions in congestion) and vehicle operating costs amounting to £965m PV and £68m PV respectively. In addituon they will experience £5m delays due to construction.The introduction of a road user charge will be a disbenefit to users of £690m PV, giving an overall net benefit of £337m PV.	Value of journey time changes(£): 965m Net journey time changes (£) < 2min: -£216m; 2 to 5min: £239m; > 5min: £942m			n/a	£337m	
	Reliability impact on Business users	Journey time reliability is expected to improve markedly for users and other travellers in the vicinity. In addition to the additional river crossing capacity, the new tunnel will provide a route for over-height vehicles that are currently unable to use Blackwall Tunnel. It is expected that the incidents of overhight vehicles blocking the tunnel approach at Blackwall will be substantially reduced.	£182m			Significant Beneficial	£182m	
	Regeneration	East London is a highly deprived area that has considerable potential to accommodate the housing and commercial development needed to support London's economy. The river Thames is a major barrier to cross river traffic for both commuters and businesses. The existing Blackwall tunnel is badly congested leading to businesses incurring additional costs thereby imposing inefficiencies on the sub-regional economy. The Scheme is one element of a wider strategy that aims to address these barriers and hence facilitate the regeneration of the area. It clearly provides the additional capacity and connectivity to support national and local economic activity and facilitate growth, job creation and regeneration, in one of the UK's most disadvantaged areas.	n/a			Beneficial	n/a	
	Wider Impacts	The Silvertown Tunnel is likely to have effects in areas other than transport. The following Wider Impacts (WI) have been identified: WI1- Agglomeration: This appraised the effect of implementing a transport scheme that brings firms closer together and closer to their workforce. These impacts are driven, for example, by increased productivity due to access to larger product, input and labour markets and knowledge and technology spill-overs. WI2- Output change in imperfectly competitive markets: When companies benefit from time savings due to a transport scheme, it is effectively a reduction in their production costs, this puts in place an incentive to increase the output while still keeping an attractive price-cost margin. This additional output increases the welfare obtained by consumers and WI2 values this change. WI3.1 Tax revenues arising from labour supply impacts: This impact estimates the effect on taxes due to a change in the number of people attracted into work as a result of an improvement in travel costs. Commuting decisions are based on after tax income, therefore the value of time used for ordinary time savings appraisals does not include exchequer benefits.	WI1: £37.9m	WI2: £60.1m	WI3.1: £6.6m	Beneficial	£104.6m	
Environmental	Noise	Daytime construction noise levels are not considered to be significant, however, they would not be within character of the local area and as such would result in a slight adverse effect on residential receptors. The assessment of the Scheme indicates that when the tunnel opens there would be negligible or minor changes in road traffic noise at the majority of receptors with a net gain of 1,302 residential dwellings experiencing a perceptible decrease in noise level. The assessment of the long term operation of the Scheme in 2036 also indicates that there would be negligible, or no-change, in road traffic noise at the majority of receptors in the day time. There would be a localised worsening of noise around the northern tunnel portal as a result of increased traffic and HGV's.	-£2.7m			Construction: Negligible to Slight Adverse Operation: Slight to moderate adverse	-£2.7m	Slight beneficial
	Air Quality	The implementation of the Scheme is predicted to result in both improvements and deterioration in air quality at worst-case receptors. In general there will be a net positive impact i.e. more receptors where concentrations of NO2, PM10 and PM2.5 are predicted to decrease than receptors where concentrations are predicted to increase.	-£0.273m			To be confirmed	-£0.273	Moderate beneficial
	Greenhouse gases	The reduction in queuing at Blackwall and wider decongestion effects will lead to a reduction in traffic-related greenhouse gas generation.	Change in non-traded carbon over 60y (CO2e) (DM-DS): -49,838t Change in traded carbon over 60y (CO2e) (DM-DS): -62t			n/a	£12m	
	Landscape	N/A - no landscape assessment	n/a				n/a	
	Townscape	During construction of the tunnel, activities such as stockpiling of material/spoil and heavy vehicle movements could cause temporary disruption to townscape and views however construction best practice such as the use of hoarding around the site would be used to limit disruption to townscape and visual amenity. In terms of permanent effects, whilst the Scheme introduces new infrastructure, it is not at odds with that already present within the local townscape and views. The Scheme includes building design and landscape proposals which would integrate the proposals with the current location and enhance the local townscape and views	n/a			Construction: minor to slight adverse. Operation: Minor to slight benefitial	n/a	
	Historic Environment	Potential disturbance of archaeological and palaeoenvironmental deposits during construction.	n/a			Construction: Moderate Adverse Operation: Neutral	n/a	
	Biodiversity	Potential slight adverse construction effects were identified due to temporary habitat loss and potential disturbance and mortality of Black redstarts. One beneficial effect was also identified, as non-native invasive species such as Japanese knotweed will be removed from the site. Mitigation would include landcaped areas and potential off site mitigation to provide like for like habitat replacement areas.	n/a			Slight Adverse	n/a	
	Marine Ecology	Changes in water quality; extent and quality of habitat; the introduction of non-native marine species (from construction material and vessels); direct loss and/or damage to river bed habitats and species; noise disturbance to fish, shellfish and marine mammals and fish and shellfish entrainment due to the construction of a temporary jetty.	n/a			To be confirmed		
	Water Environment	Construction work may cause heavily silted or contaminated runoff to nearby water bodies (eg. the River Thames). A temporary drainage network would be installed during the construction period. Any drainage discharge would be treated prior to entry into the water environment. Scheme would adhere to the Environment Agency's Pollution Prevention Guidelines and the CoCP. Existing standards of flood protection will remain unchanged during construction and operation. Hydrodynamic modelling which looks at the change in suspended sediments and water quality as a result of the proposed jetty at Silvertown has been undertaken and has shown no significant effects on the existing flow or sediment transport regimes of the River Thames. The Scheme is generally at low risk of surface water flooding and the existing drainage system would be improved resulting in a minor beneficial change to the water quality.	n/a			Neutral	n/a	
Social	Commuting and Other users	Commuting and Other users benefit significantly from the provision of Silvertown Tunnel through reduced travel time (including reductions in congestion) and vehicle operating costs amounting to £1,131m PV and £36m PV respectively. In addituon they will experience £6m delays due to construction.The introduction of a road user charge will be a disbenefit to users of £428m PV, giving an overall net benefit of £732m PV.	Value of journey time changes(£): £1,131 Net journey time changes (£) < 2min: -£54m; 2 to 5min: £274m; > 5min: £911m			n/a	£732	Moderate beneficial
	Reliability impact on Commuting and Other users	Journey time reliability is expected to improve significantly for commuters and other travellers. In addition to the additional river crossing capacity, the new tunnel will provide a route for over-height vehicles that are unable to use Blackwall Tunnel. It is expected that the incidents due to congeston and overheight vehicles blocking the tunnel approach at Blackwall will be substantially reduced.	£116m			Significant Beneficial	£116m	
	Physical activity	No provision for active modes is included in the Scheme reference tunnel design. A small mode shift from car to PT will lead to a small increase in physical activity.	n/a			Slight beneficial	n/a	
	Journey quality	Improvements in reliability and reduction in congestion are expected to reduce driver stress	n/a			Large beneficial	n/a	
	Accidents	The full accident analysis is reported in the Silvertown Economic Assessment Report and shows that the overall change in accidents at all levels of severity is medium with positive benefits of £35.9m	£35.9m			Slight beneficial	£35.9m	Moderate beneficial
	Security	The Silvertown Tunnel is not expected to have a material impact on security to road users.	n/a			Neutral	n/a	n/a
	Access to services	Positive net impact on public transport accessibility as a result of improved resilience and reliability and enhanced services.	n/a			Moderate beneficial	n/a	Moderate beneficial
	Affordability	The Scheme will result in increases to car user charges.Car user charges will have a slight adverse impact on low income users and a large adverse impact on medium and high income users. Public transport users may benefit from new bus services that offer cheaper options than are currently available, which would be of particular benefit to people on low incomes.				Neutral	-£9.3m	Neutral
	Severance	The scheme will have a neutral overall impact on existing severance issues. High concentrations of vulnerable groups on minor roads with decreases in vehicle flow will enhance the local positive impacts for those groups.	n/a			Neutral	n/a	Slight beneficial
	Option and non-use values	Two new bus routes and four enhanced bus routes are likely to be introduced, with 12,000 households situated within 100m of the route alignments.	n/a			Moderate beneficial	n/a	
Public Accounts	Cost to Broad Transport Budget	The Silvertown Tunnel scheme (including introduction of road user charging) will require an investment in the transport network of £553m PV. Operating and maintenance of the Tunnel over 60 years amount to £536m PV and Operating costs of the improved/new bus services oveer 60 year amount to £307m PV, giving a total PV of costs of £1,396m. Revenues are treated as part of wider public finances for appraisal purposes. When the revenues from road user charging and bus operation of some £1,401m PV are offset against costs, the overall PV of net costs is -£4.65m.	£1,396m costs (including bus operating costs), offset by £1,401m revenue			n/a	£1,396m costs, offset by £1,401m revenue	
	Indirect Tax Revenues	As a result of reduced operating costs from reductions in congestion and delays, and in particular a reduction in fuel consumption, there will be a loss in indirect taxation of £143m (PV over 60 years).	-£143m			n/a	-£143m	