MOTT MACDONALD

Canada Water Strategic Transport Study

Forecasting Report

December 2018

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Executive summary

Study Context

The area surrounding Canada Water station on the Rotherhithe Peninsula has been identified as an Opportunity Area (OA) in the London Plan, and owing to its location and good transport connectivity has generated a large amount of developer interest. Despite committed transport investment, development of the OA is likely to further exacerbate pressures on the transport system caused by future population and employment growth in the wider area.

This commission, and the information within this Forecasting Report, will be used to provide the empirical evidence to support the production of a Transport for London (TfL) and London Borough Southwark (LBS) jointly authored Strategic Transport Study (STS), which in turn will support an updated Area Action Plan (AAP) document.

The empirical evidence base will be derived from the development and application of TfL's suite of strategic models:

- London Transportation Studies Model (LTS) – a variable demand model able to forecast future trip making numbers, mode choice and distribution in London
- Railplan – a fixed demand assignment model representing public transport in London
- Central London Highway Assignment Model (CLoHAM) – a fixed demand assignment model representing the highway network in Central London

In addition, but not reported in this document, detailed pedestrian movement station modelling has been undertaken using Legion.

Content of this Report

This Forecasting Report summarises the development and application of the three strategic models outlined above.

The development stages of each model involves applying appropriate local updates and enhancements to increase the accuracy of forecast outputs. In the case of LTS, this also includes the specification of land use and other demand driver assumptions that form the basis of the trip making assumptions for the study.

The application stages of the modelling involves creating reference scenarios with and without development, from which local challenges to the transport network have been identified. The study has subsequently sought to address these challenges through a series of mitigation tests; individual schemes and packages of schemes designed to reduce the impact of the development on road and public transport conditions.

Modelling Scenarios

The following scenarios are referred to throughout this document:

1. **Base Year** – a modelled year close to present day that has been locally validated and calibrated to best reflect known conditions. Updates to the base model are implemented in the forecast scenarios to improve robustness of outputs.
2. **Do Minimum –** a 2031 forecast year representing committed and funded transport schemes, London wide growth in travel demand and currently consented land use changes.

3. **Medium Development –** a 2031 forecast year representing committed and funded transport schemes, London wide growth in travel demand and land use changes based on current planning application and masterplan proposals from OA developers.
4. **Max Growth –** a 2041 forecast year representing committed and funded transport schemes plus Canada Water mitigation schemes and other major potential schemes such as Crossrail 2. Land use in this scenario reflects and unconstrained build out of all Opportunity Areas across London. This scenario is used to understand the resilience of mitigation measures in what currently represents a theoretical maximum land use and transport scenario for London.

Note; all of the above scenarios represent unmitigated transport networks.

Key Challenges

The impact of the OA development on the highway network has been summarised into the following key challenges:

- Increases in traffic on residential roads such as Needleman Street
- Through traffic accessing the Rotherhithe Tunnel
- Increased severance due to more traffic using the Lower Road gyratory
- Congestion increasing bus journey times and reduced reliability.

The impact of the OA development on the public transport network have been summarised into the following key challenges:

- Line loads on the Jubilee Line and London Overground
- Crowding conditions on these lines
- Interchange between London Overground and Jubilee Line at Canada Water
- Low bus mode share for trips to/from the area

The nature of these challenges vary between those that are a direct result of the OA development and those where the impact of the OA is smaller but exacerbates challenges inherent from future background growth across London.

The medium-growth scenario produces over 4,100 additional public transport trips from the development and an additional 10,300 public transport trips into Canada Water compared with the Do Minimum Scenario over the 3 hour AM peak period. This puts significant additional pressure on the Jubilee line (the main line of access to the development) and also results in additional interchange from the Overground. Such is the additional demand that 'Medium-growth' crowds off trips eastbound onto other routes. The Elizabeth Line alleviates the crowding on the Jubilee Line initially but thereafter, the additional development causes further crowding on the line and issues in particular at Surrey Quays and Canada Water stations.

In the PM peak, 751 additional highway pcus are generated with medium growth, over 40% of these are goods vehicles (light and heavy) and private vehicles being driven in work time also increases, reflecting the office development in the area. These additional trips occur despite an overall reduction in Car trips per household which have reduced to reflect the low car mode-share proposed. Car use could be further reduced by additional travel demand management measures in the area and an encouragement to walk and cycle both locally (where over 1000 trips are within 15 mins by cycle) and across the river, however the Rotherhithe tunnel is not conducive to safe cycling. Development traffic struggles to gain access and egress via Surrey Quays Road resulting in some rat-running via local roads such as Salter Road and capacity issues at the Rotherhithe roundabout. A significant proportion of the additional medium-growth development accesses via the tunnel, displacing through-traffic onto other cross-river routes with knock on effects at London Bridge and Tower Bridge. The impacts are therefore quite widely felt across the strategic highway network, locally the 381 and 188 bus routes experience additional delay.

Mitigations

A series of mitigation tests and packages of tests have been modelled to understand the effectiveness of measures to reduce the severity of the challenges identified. Individual schemes have been tested in the assignment models to help define packages of schemes that have subsequently been tested in LTS.

These have sought to address local issues where possible, for example bus connectivity, cycle superhighway 4, and also the wider issue of background demand growth, for example strategic upgrades to competing and contributory transport routes.

The mitigations tested in this study have been strategic in nature, reflecting that the issues are a result of both London-wide growth and the impact of local development around Canada Water. It recognises that this location is also a key route and interchange hub for trips to Central London and Canary Wharf. The Elizabeth line, Jubilee and Overground capacity enhancements offer some relief but are soon crowded again due to reassignment and new development. Local interventions such as the bus strategy make a smaller contribution, as do localised enhancements such as at Shadwell Interchange.

The 2041 Maximum growth scenario incorporates a number of major transport enhancements to the Elizabeth Line, DLR, Jubilee Line, Bakerloo Line Extension, London Overground and local buses. However, it also models a lot of additional demand across London in general but particularly at Canada Water, Lewisham and the BLE corridor, the Crossrail2 corridor, Greenwich and the Isle of Dogs so significant crowding issues remain.

An integrated approach encompassing improved public transport, travel demand management, low car mode initiatives and improved facilities for non-motorised modes can have an impact on the operation of the highway network. However local reductions could be replaced with through traffic on key strategic routes if complimentary measures are not included. Tolling on the Silvertown and Blackwall tunnels had little impact on Peninsular traffic while tolls on both crossings and the Rotherhithe tunnel did have an impact reducing traffic on Lower Road.

Multiple options for the provision of road-space for Cycle superhighway 4 were also modelled together with a restructuring of the gyratory on Lower Road. The loss of vehicular capacity resulted in reassignment of traffic to Southwark Park Road and rat-running through the Peninsular.

Conclusions

The conclusions of this Forecasting Report and subsequent key themes in the STS are focussed around the implications of developing an area whose existing highway and public transport routes are highly stressed in current day conditions and that will, regardless of additional development, come under further stress due to natural growth predicted in the capital.

Some of the challenges identified could also be adversely affected by land developments elsewhere, by changes in committed network improvements (for example, the uncertainty surrounding Northern and Jubilee Line upgrades) and parallel policies such as road space reallocation.

The modelling has shown that the Medium growth scenario generates significantly more trips than the Do-Minimum committed scenario. Adjustments have been made to the modelling to reflect low car mode share which will need to be achieved to mitigate this, the results suggest that further measures to manage demand and promote non-motorised modes are necessary to retain efficient highway and public transport networks and functional, safe stations for access and interchange.

Furthermore, the level of development that can be accommodated depends on major investment decisions for stakeholders and the level of service enhancements on key services, in particular investment in Jubilee Line and London Overground services. In the context of long-term wider London development, and in particular development on the Greenwich Peninsular, Isle of Dogs, Lewisham and Old Kent Road, the introduction of major infrastructure projects including BLE, DLR enhancements and Crossrail2 are also key.

The study also highlights a range of more local schemes such as improving bus provision to reduce crowding on the rail network. Cycle Superhighway 4 offers better and safer cycling facilities to encourage the shift from motorised modes, however, cycle and pedestrian access to Canary wharf and locations across the Thames could help to significantly alleviate the capacity issues on the Jubilee Line. The modelling showed that access to the development for highway traffic would need to be carefully considered, arrangements to accommodate the additional trips on strategic roads were necessary to prevent rat-running through the Peninsular and to the west of Lower Road – a particular challenge if road-space is reallocated. Beyond the locality re-routeing of strategic traffic needs to be considered.

1 Introduction

This Forecasting Report describes the development and use of TfL's strategic transport modelling suite to provide demand, public transport (PT) and highway forecasting of the impacts of population and employment change in the Canada Water Opportunity Area to inform the Canada Water Strategic Transport Study (STS). Mott MacDonald have been commissioned to undertake this work by a joint client team of Transport for London (TfL) and London Borough of Southwark (LBS).

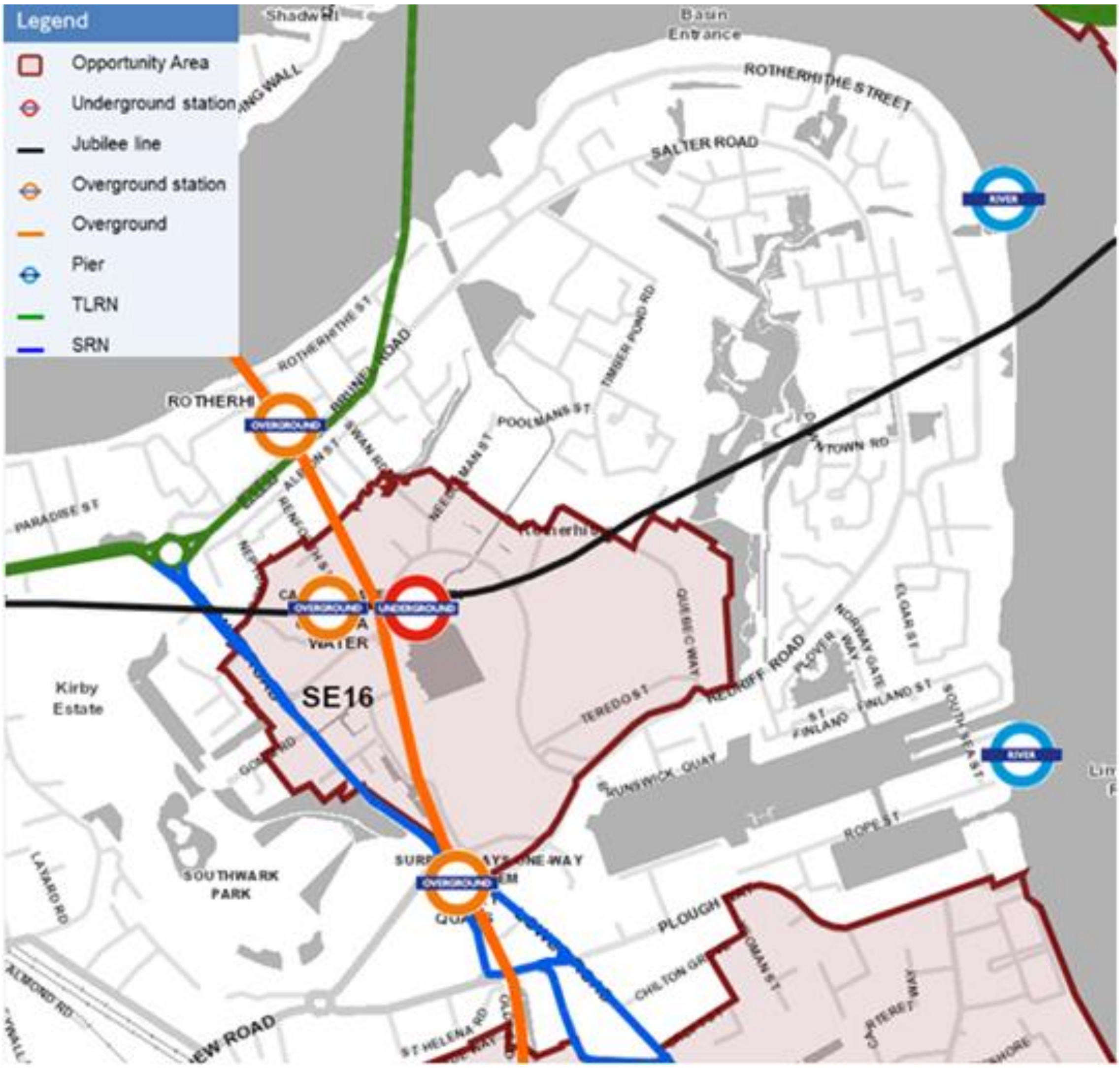
1.1 Canada Water Opportunity Area

Canada Water was identified as an Opportunity Area in the London Plan in 2015; previously it was an Area for Intensification. It has the potential to accommodate a significant amount of new homes and jobs in a sustainable location. Due to its zone 2 location with good transport links, the Opportunity Area (OA) has generated a lot of interest including an emerging developer prepared masterplan for parts of the OA. However, despite committed transport investment, future challenges are anticipated, exacerbated by the scale of growth in the wider area; a vast amount of growth potential has been identified on transport corridors that could impact conditions at Canada Water, for example, Old Kent Road, Isle of Dogs and other stations on the Jubilee Line corridor.

Canada Water station, located centrally within the OA, has a very sensitive location on the public transport network, being on the busiest section of the Jubilee line and a major interchange. It is also a key interchange with buses with many people in the surrounding areas using Canada Water as a rail head.

Canada Water and surrounding area is also a very sensitive location on the road network. Cycle Superhighway 4 (which would run between Tower Bridge and Greenwich) is intended to pass close by and could involve removal of the Lower Road gyratory. The southern entrance to the Rotherhithe tunnel, part of the Transport for London Road Network (TLRN) is just to the west accessed off the Lower Road/Jamaica Road roundabout.

Figure 1: Canada Water Opportunity Area



Source: Transport for London

1.2 Strategic Modelling Suite

TfL’s strategic modelling suite will be used to provide quantitative assessment of future travel patterns and the impacts of land use development in the OA. The models will also be used to test the effectiveness of mitigation packages designed to minimise negative impacts.

1.2.1 LTS Demand Model

LTS is TfL’s demand model capable of forecasting trip making, mode choice and trip distribution based on future year assumptions. To this end, it is able to reflect the land use changes in the OA and also transport schemes locally and London wide.

LTS provides 24-hour trip matrices which are then converted to the more disaggregate zone systems and time periods of the assignment models.

Canada Water OA specific inputs to LTS are outlined in **Table 1**.

Table 1: LTS input parameters

Input Assumption	Re-specified?	Rationale
Number of households	Yes	Key trip production driver, update to represent latest development assumptions
Population (and hence assumed household occupancy levels)	Yes	Key trip production driver, update to represent latest development assumptions
Demographic breakdown of population into age bands	No	No suitable source of data
Number of jobs, and split between blue and white collar	Yes	Trip attraction driver, update to represent latest development assumptions. Update to reflect expected land use types
Number of workers (resident population), split between blue and white collar	No	Not explicitly re-specified. This primarily has an impact on commute trip distances, with white collar workers being prepared to travel longer. Given the vast number of jobs within a short commute of Canada Water this assumption is not expected to have a large impact on travel demand.
Retail floorspace	Yes	Key trip attraction driver, update to represent latest development assumptions
Car ownership per head	Yes	Mode share driver, updated to reflect current policy
Number and type of parking spaces. Car Ownership assumptions are a greater determinant of origin based mode share than parking inputs. Parking assumptions are more important on a destination basis, i.e. the number of retail and workplace parking spaces.	No for Do-minimum, Yes for Medium	No suitable source of data. However, we will ensure that the increment between the 2031 do-min and 2031 with development scenarios reflects the development plans, i.e. represent the net change in parking spaces. For Medium scenario, available parking spaces have been adjusted
Number and type of school children	Yes	Trip attraction driver, updated with latest borough estimates

Detailed LTS inputs for the Do Minimum and Medium Development scenarios can be found in **Section 4**.

1.2.2 Assignment Models

Emme Railplan and the Central London Highway Assignment Model (CLoHAM) have been developed to test land use changes and transport impacts at a strategic level on the public transport and highway networks respectively. Each of the models has been locally validated and calibrated and updated to reflect the latest assumptions and increased detail in the OA area; further detail of these updates including zone disaggregation are described in **Sections 2 and 3**.

The assignment models use fixed demand matrices derived from LTS.

An overview of the assignment models is provided below.

- Railplan
  - 2011 Base Year, 2031 and 2041 Forecast Years
  - v7.0 (2011 Base) and v7.1 (Forecast Years)
  - 3 hour AM Peak Period (07:00-10:00)
  - Rail, Bus, Underground, Tram and DLR modelled
- CLoHAM
  - 2012 Base Year, 2031 and 2041 Forecast Years
  - P3 reference networks

- PM Peak Hour (17:00-18:00)
- Vehicle traffic modelled

1.3 Scenarios

The following core scenarios have been developed to provide the evidence base for this study.

- **Base Years** (2011 for PT modelling, 2012 for HAM modelling) – locally calibrated and validated models enhanced and refined to provide accurate model flows against observed data. Having these models gives us a reliable basis for forecasting and allows us to understand the degree to which identified transport challenges are due to background growth trends.
- **2031 Do-minimum** – this scenario builds on the validated base models, combined with a review of future transport network assumptions, to provide the future reference point upon which OA developments impacts can be compared. This scenario assumes 2011 land use plus know developments up to current day and currently consented planning applications.
- **2031 Medium Development** – this scenario builds on the do-minimum scenario to include non-consented land use developments in the OA area, including sites owned by British Land and Sellar. This scenario provides the OA impact challenges which will in turn inform mitigation schemes. The transport networks in this scenario are unmitigated.
- **2041 'Max growth'** – this scenario does not form part of the core assessment of the impacts of the Canada Water OA, but has been used to test the effectiveness of the final mitigation package against a further time horizon and one that reflects a "Max growth" build out of other OAs across London in addition to the Canada Water.

In addition to the core scenarios, multiple mitigation scenarios have been run in the assignment models and LTS, these are detailed in **Sections 10, 11 and 12**.

1.4 Document Structure

The remainder of this document is structured as follows:

Sections 2 and 3 outline the development of the assignment model networks.

Section 4 details the land use and demand drive input assumptions for the LTS demand model.

Section 5 and 6 summarise the assignment matrices used in Railplan and HAM.

Sections 7, 8 and 9 summarise the findings from the core models and the transport challenges identified.

Sections 10 and 11 summarise the assignment only mitigation tests assessed in Railplan and HAM, and **Section 12** summarises the mitigation package testing.

Section 13 outlines the conclusions of the strategic modelllling.

2 Public Transport Future Year Networks

This section outlines the review undertaken of the future year reference case network in order to produce networks for use in the 2031 Do-Minimum and Medium development scenarios (as reported in **Section 7**). The Do-Minimum and Medium networks differ only in the walk network around the development area. The Medium development network also formed the starting point for the mitigation scenarios (as reported in **Section 10**).

2.1 Reference case networks

The 2031 AM Railplan v7.1 committed reference case network including HS2 was provided to Mott MacDonald by TfL, which was used as the starting point for all Canada Water STS forecasting networks (including 2041 Max Growth forecasting, which utilises the 2031 network). The network did not contain any bus services but these were provided separately from the 2031 AM Crossrail 2 Baseline (run XA621).

The AM Peak Period refers to an average weekday between 07:00-10:00.

2.2 Base year updates

The following changes were made to the future year network to keep it consistent with the re-calibrated Canada Water base year network. These changes were made to the base year network as part of the calibration/validation exercise. Each network alteration has been assessed to check if it is still applicable in the future year network:

- Disaggregation of Railplan zones 3694, 3678 and 3674, creating new zones 3601, 3602 and 3603;
- Walk network updates improving accuracy around the development area;
- Bus routing updates for the 47 and 381 services; and
- Node-specific boarding penalty adjustments for Overground (from 7 minutes to 1.75 minutes) and Crossrail Core section (from 7 minutes to 3.5 minutes) platforms.

Further details of these changes can be found in the Local Model Validation Report[1].

2.3 Forecasting network review

We have undertaken an audit of the 2031 AM Committed (including High Speed 2) Reference Case transport network provided by TfL for the purposes of this study. The aim of the audit is to ensure that any planned future transport enhancements in close proximity to the study area have been incorporated into Railplan and correctly implemented.

Relevant future transport enhancements have been provided by TfL[2]. We have reviewed the content of the provided list and created a shortlist of schemes that we feel could prove relevant to forecasting in the Canada Water area:

[1] CanadaWater_STS_RP_LMVR_2a_v1.docx

[2] RP 7.1 Scheme Specs_V2 MM2.xlsb

Table 2: Future PT schemes with major relevance to Canada Water

Scheme ID	Scheme	TOC/Area	Year	Comments
National Rail				
NR75	Major Station improvements: East Croydon, Brockley, Streatham	Station impv	2016	East Croydon, Brockley, Streatham
NR30	Thameslink revised service pattern	Thameslink	2021	Revised Service Pattern proposed by new Franchise in 2014
NR45	Revised Essex Thameside service provision (stock and calling pattern)	c2c	2021	Revised c2c service provision, franchisee Commitment 2014
London Overground				
OV09	LO Capacity Improvement: 10 tph NLL	NLL/WLL	2021	5 car 378; addtl 2 tph Clapham Jn - Stratford all day
OV10	LO Capacity Improvement: additional 2 tph ELL PIXC Busters	ELL	2021	5 car 378; addtl 2 tph Dalston Jn - Crystal Palace all day;
OV23	South Bermondsey (see Surrey Canal Road) station	SLL	2021	To be completed in 2018
OV11	LO Capacity Improvement: additional 2 tph	ELL	2021	5 car 378; possible addtl 2 tph Dalston Jn - Clapham Jn all day
OV14	LO Frequency enhancements			Potential early start using leased class 387 or 319
OV17	LO Capacity Improvement - 6 car operation East, North and West London Lines	ELL/NLL/WLL	2026	Possible in 2020s
OV21	Removal of New Cross branch and enhanced frequency to West Croydon or Crystal Palace	ELL	2041	Possible in late 2020s / 2030s
OV22	Extension of New Cross branch to Bromley North	ELL	2041	Possible in late 2020s / 2030s
London Underground				
LU10	Northern Line 'short tripping'	Northern	2016	Introduced in December 2014, some peak services reverse at Golders Green or Finchley Central.
LU06	Jubilee Line Upgrade (34tph)	Jubilee	2021	Requires additional stock
DLR				
DK05	Changes due to Crossrail (Base Service Plan E)	DLR	2018	Redeploy capacity as a result of Crossrail opening in 2018 prior to delivery of new trains in 2021
DK06	New Train for Docklands	DLR	2024	Funded to deliver extra trains for Royal Docks Capacity Programme and replacement of B92 Fleet (2024)
DK07	North Route Double Tracking Phase 2 (Base option) – 20tph 2-car, with reduction of STR-LEW to 5tph	DLR	2026	No rolling stock required for the base option, although strong case to add some to the New Train order

Scheme ID	Scheme	TOC/Area	Year	Comments
DK09	Royal Docks initial capacity enhancements	DLR	2026	Extra capacity/rolling stock required for developments on Beckton & Woolwich branches
London Buses				
BS01	4% frequency/capacity increase	Bus	2021	Model-wide increase in frequency
BS02	5% frequency/capacity increase by proportion of Borough's Population growth	Bus	2016	2014 Business Plan

We have reviewed the 2031 AM network against this specification either directly or in comparison to the 2011 Base scenario (WE001A08A) provided for the purposes of this study.

The following subsections consider each of the schemes from **Table 2** in turn; how these are represented in the existing 2011 and 2031 Railplan networks, and whether any corrective action is required.

2.3.1 Scheme ID NR75: Brockley Station Improvement (2016)

This is not reflected in Railplan; the station interchange connections and link lengths (shown in **Table 3**) are identical to the 2011 Base. Details of the improvements are not committed and are assumed to relate to customer experience therefore no change is applied in Railplan.

Table 3: Brockley Station Interchange Distances, Railplan 2031 AM

PLATFORMS		390701 Brockley Coulgate St SE [1]	390762 Brockley Southern (Dwn)	390763 Brockley Southern (Up)	TOTAL
390701	Brockley Coulgate St SE [1]		0.15	0.15	0.30
390762	Brockley Southern (Dwn)	0.15			0.15
390763	Brockley Southern (Up)	0.15			0.15
TOTAL		0.30	0.15	0.15	0.60

Action – no action taken.

2.3.2 Scheme ID NR30: Thameslink Revised Service Pattern (2021)

Table 4 shows total Thameslink frequency and capacity serving London Bridge and Elephant & Castle in both directions in the 2011 Base Scenario and 2031 AM Reference Case. It shows a significant increase in total service provision in the future year, which is due entirely to enhancement of service provision through London Bridge as service provision is reduced through Elephant and Castle. These changes reflect improvements to the Thameslink service starting in summer 2018 continuing through to 2020 ("Railplan2020") which also accounts for the major redevelopment of London Bridge Station.

Table 4: Thameslink Service Provision, Railplan 2031 AM

	TPH		Seat Capacity		Total Capacity	
	Base Year	Future Year	Base Year	Future Year	Base Year	Future Year
London Bridge SB	2.33	16.00	1,364	9,512	3,835	37,392
London Bridge NB	1.33	16.00	777	9,512	2,156	37,392
E & C SB	9.33	8.00	5,138	3,328	13,106	13,392
E & C NB	11.33	4.00	6,077	1,664	15,500	6,696
Total SB	**11.67**	**24.00**	**6,503**	**12,840**	**16,940**	**50,784**
Total NB	**12.67**	**20.00**	**6,855**	**11,176**	**17,656**	**44,088**

Action – no action taken.

2.3.3 Scheme ID NR45: Essex Thameside Revised Service Pattern (2021)

Table 5 shows total eastbound service frequencies and capacities from Fenchurch Street in the Railplan 2011 and 2031 scenarios and the differences between these scenarios. It shows a total 65% increase in service frequency and 38% increase in total capacity. The future specification aligns with information provided by c2c. There have been small revisions since this specification was coded; however, these would not have a material impact on our modelling, therefore we have not implemented any changes.

Table 5: Essex Thameside Service Provision, Railplan 2011 AM and 2031 AM

	2011			2031			Difference 2031-2011			% Difference 2031-2011		
	Frequency (tph)	Seated Capacity	Total Capacity	Frequency (tph)	Seated Capacity	Total Capacity	Frequency (tph)	Seated Capacity	Total Capacity	Frequency (tph)	Seated Capacity	Total Capacity
FENCHRS-SHBRYNS	4.0	2147	5581	5.7	3080	8008	1.7	933	2427	42%	43%	43%
FENCHRS-PITSEA	1.3	560	1456	3.0	840	1941	1.7	280	485	125%	50%	33%
FENCHRS-GRAYS	1.0	467	1213	2.7	747	1941	1.7	280	728	167%	60%	60%
FENCHRS-STHCENT	2.0	1027	2669	2.0	933	2427	0.0	-93	-243	0%	-9%	-9%
FENCHRS-LAINDON	0.3	187	485	0.7	373	971	0.3	187	485	100%	100%	100%
FENCHRS-LEIGH	0.0	0.0	0.0	0.3	187	485	0.3	187	485	n/a	n/a	n/a
TOTAL	**8.7**	**4387**	**11405**	**14.3**	**6160**	**15773**	**5.7**	**1773**	**4368**	**65%**	**40%**	**38%**

Action – no action taken.

2.3.4 Scheme ID OV09: London Overground NLL/WLL Capacity Improvement (2021)

These improvements comprise an increase in service capacity from 4 car to 5 car trains and service frequency on Clapham Junction – Stratford services of 2tph. These are reflected in the 2031 AM Reference Case (when compared against the 2011 Base) although the increase in service frequency on Clapham Junction – Stratford services is 2.33tph; this slightly higher modelled frequency will account for additional peak hour services..

Action – no action taken.

2.3.5 Scheme ID OV10: London Overground ELL Capacity Improvement (2021)

These improvements comprise an increase in service capacity from 4 car to 5 car trains and service frequency on Dalston Junction – Crystal Palace services of 2tph, in line with planned TfL service updates. The capacity increase is reflected in the 2031 AM Reference Case (when compared against the 2011 Base). The frequency increase is reflected in an increase of 2tph to Highbury and Islington – Crystal Palace services.

Action – no action taken.

2.3.6 Scheme ID OV23: Surrey Canal Road Station (2018)

This new station is included in the 2031 AM Reference Case and is served by Clapham Junction – Highbury and Islington Overground services. The station interchange connections and link lengths are shown in **Table 6**. The link lengths appear reasonable for a simple two-platform station and are consistent with similar such stations along the ELL stretch of the Overground.

Table 6: Surrey Canal Road Station Interchange Distances, Railplan 2031 AM

PLATFORMS		370701 SURREY CANAL ROAD ELL ENT	370762 SURREY CANAL ROAD ELL (SB)	370763 SURREY CANAL ROAD ELL (NB)	TOTAL
370701	SURREY CANAL ROAD ELL ENT		0.10	0.10	0.20
370762	SURREY CANAL ROAD ELL (SB)	0.10			0.10
370763	SURREY CANAL ROAD ELL (NB)	0.10			0.10
TOTAL		0.20	0.10	0.10	0.40

Local walk network connections to the station are shown in **Figure 2**. The two long station interchange links between the station entrance and the local walk network have been avoided by connecting the station entrance to a more local walk node on Surrey Canal Road. The local zone (8296) should also not be connected directly into the station entrance. These updates are shown in **Figure 3**.

Figure 2: Surrey Canal Road Station Walk Network Connections, Railplan 2031 AM

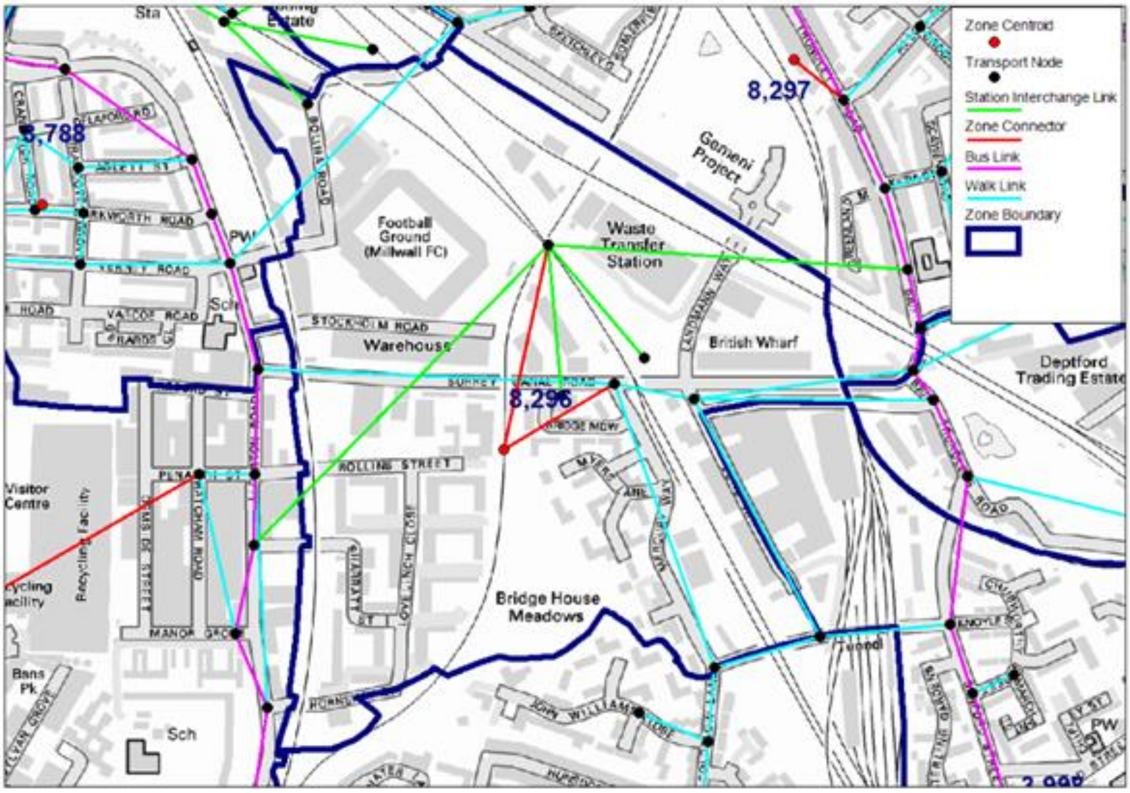
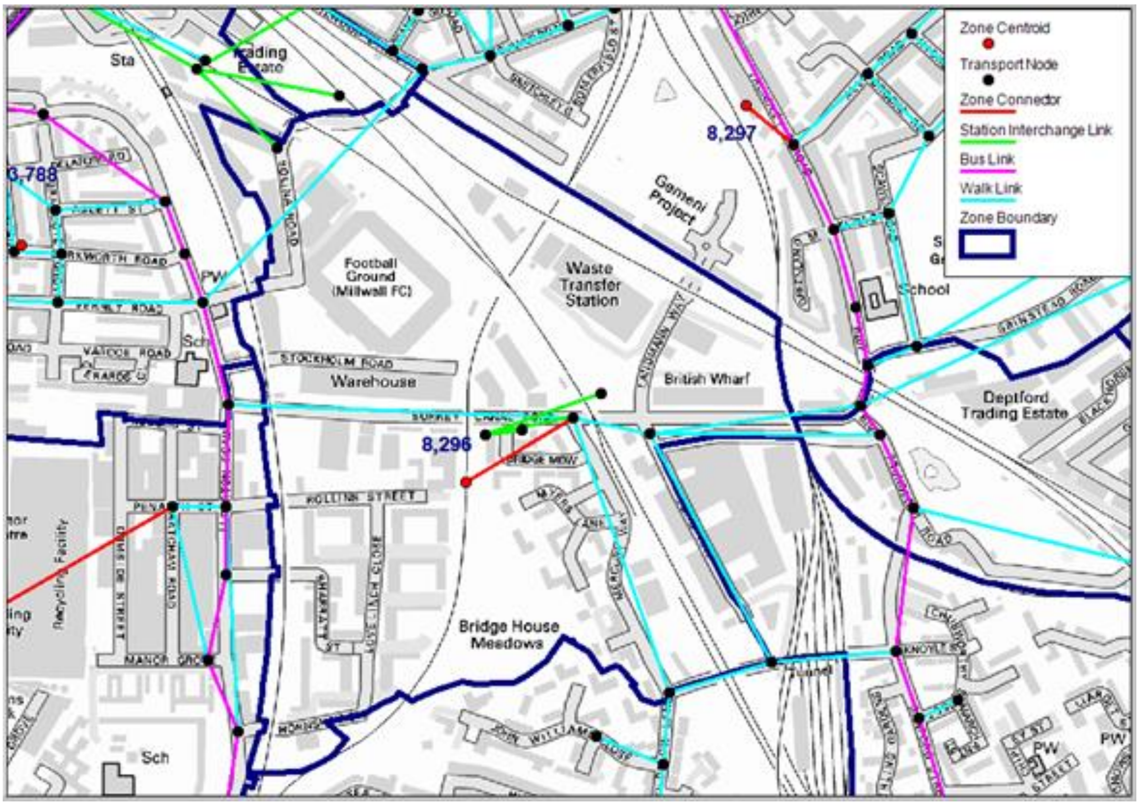


Figure 3: Proposed Updates to Surrey Canal Road Station Walk Network Connections, Railplan 2031 AM



Action – walk network amended as per Figure 3.

2.3.7 Scheme ID OV11/OV14/OV17: London Overground Frequency/Capacity Improvements (2021/2026)

Table 7 and **Table 8** show vehicle types, capacities and headways on each individual Overground service in the 2011 Base and 2031 Reference Case respectively. The key differences are:

- NLL/WLL/ELL services are enhanced from 4 car to 5 car giving a 25% increase in capacity on those services. Six car operation not implemented on these services.
- A series of new Overground services are introduced post-2011 e.g. Liverpool Street - Chingford; these tend to use stock types with a higher overall capacity.

Table 7: Overground Services, Railplan 2011 AM Base

line	description	veh desc	seat cap	total cap	hdwy
OV003W	BARKING-GOSPLOK 2J00	2c172	73	387	15
OV004E	GOSPLOK-BARKING 2J07	2c172	73	387	15
OV005E	CLPHMJ2-STFD 2L50	4c378	146	874	16.36
OV006N	CLPHMJ2-WLSDJHL 2Y70	4c378	146	874	90
OV009W	STFD-CLPHMJ2 2Y11	4c378	146	874	16.36

line	description	veh desc	seat cap	total cap	hdwy
OV010S	HIGHBYA-CRYSTLP 9A09	4c378	146	874	15
OV011N	CRYSTLP-HIGHBYA 9B05	4c378	146	874	15
OV012S	HIGHBYA-WCROYDN 9C08	4c378	146	874	15
OV013N	WCROYDN-HIGHBYA 9D04	4c378	146	874	15
OV014S	DALS-NWCRELL 9E08	4c378	146	874	15
OV015N	NWCRELL-DALS 9F07	4c378	146	874	15
OV101U	WATFJDC-EUSTON 2C06	4c378	146	874	22.5
OV102D	EUSTON-WATFJDC 2D86	4c378	146	874	20
OV107E	RICHNLL-STFD 2N04	4c378	146	874	15
OV108W	STFD-RICHNLL 2N11	4c378	146	874	15

Table 8: Overground Services, Railplan 2031 AM Reference Case

line	description	veh desc	seat cap	total cap	hdwy
OV201S	DALSTN-NEWX	5c378	183	1093	15
OV202N	NEWX-DALSTN	5c378	183	1093	15
OV203S	DALSTN-WCROYDN	5c378	183	1093	15
OV204N	WCROYDN-DALSTN	5c378	183	1093	15
OV205U	CHESHNT-LIVST 2D03	8c710	390	1772	30
OV206D	LIVST-CHINGFD 2T08	8c710	390	1772	16.36
OV207U	CHINGFD-LIVST 2T13	8c710	390	1772	30
OV208U	CHINGFD-LIVST 2T15	8c710	390	1772	30
OV209U	CHINGFD-LIVST 2T99	8c710	390	1772	180
OV210U	ENFLDTN-LIVST 2U05	8c710	390	1772	30
OV211U	ENFLDTN-LIVST 2U07	8c710	390	1772	30
OV212D	LIVST-ENFLDTN 2U10	8c710	390	1772	18
OV213D	LIVST-CHESHNT 2D10	8c710	390	1772	180
OV214D	LIVST-CHESHNT 2D12	8c710	390	1772	60
OV215D	LIVST-CHESHNT 2D18	8c710	390	1772	90
OV216N	CLPHMJ2-WLSDJHL 2Y70	5c378	183	1093	90
OV217E	RICHNLL-STFD 2N04	5c378	183	1093	15
OV218W	STFD-RICHNLL 2N11	5c378	183	1093	15
OV219U	WATFJDC-EUSTON 2C06	4c710	195	886	15
OV220D	EUSTON-WATFJDC 2D86	4c710	195	886	15
OV221W	BARKING-GOSPLOK 2J00	4c710	195	886	15
OV222E	GOSPLOK-BARKING 2J07	4c710	195	886	15
OV223S	DALSTON-CPALACE	5c378	183	1093	10
OV224N	CPALACE-DALSTON	5c378	183	1093	10
OV225E	CLPHMJC-HBRYISL	5c378	183	1093	15
OV226W	HBRYISL-CLPHMJC	5c378	183	1093	15
OV227E	CLPHMJ2-STFD 2L50	5c378	183	1093	10
OV228W	STFD-CLPHMJ2 2Y11	5c378	183	1093	10
OV290D	ROMFORD-UPMNSP6 2V06	4c317	262	692	25.71
OV291U	UPMNSP6-ROMFORD 2V07	4c317	262	692	25.71

Action – no action taken.

2.3.8 Scheme ID DK05/DK06/DK07/DK09: Docklands Light Railway (2018-2026)

In discussion with TfL modelling team we are satisfied that the DLR specification implemented within Railplan represents an agreed (with DLR) future year service pattern which is the aggregation of numerous upgrades and alterations.

Action – no action taken.

2.3.9 Scheme ID BS01/BS02: Bus (2021)

There is approximately a 4% increase in frequency (and therefore total capacity) on every bus service in the Railplan 2031 AM Reference Case compared to the 2011 Base. This corresponds with Scheme BS01 in the specification.

Action – no action taken.

2.3.10 Other

2.3.10.1 Overground

The Reference Case assumes ELL 18tph via Canada Water; however, due to rolling stock redeployment, the existing 16tph should be assumed to be retained. 2tph has been removed from Crystal Palace services so 16tph = 4tph Clapham Junction, 8tph New Cross Gate (4tph West Croydon + 4tph Crystal Palace), 4tph New Cross.

Action – reduce ELL frequency via Canada Water from 18tph to 16tph.

2.3.10.2 Bus

It should be noted that Railplan bus service assumptions do not change between base and future years (with the exception of a small globally applied frequency increase), as such key local routes have been checked for any known or planned changes to routes since 2011. Additionally, small changes to routings can be implemented on the ground by TfL with relative ease and model coding is not updated at the same pace. As a result corrections were made to the stopping pattern of the P12 and 47 bus routes. A correction was made to the routing of the 381 to take it via Tooley Street rather than Elephant & Castle, since this diversion ends in 2018. Further corrections were made to routings around Canada Water and Surrey Quays of the following routes: 1, 47, 188, 199, 225, and 381.

Action – routing corrections.

2.4 Network detail to accommodate new development

The Railplan model represents a skeletal walk network which includes major and minor roads; these are used to allow access and egress between demand zones and public transport services. The reference case walk network reflects the strategic nature of Railplan and as such is relatively sparse around the Canada Water masterplan area.

To better reflect the road layout post-Canada Water development and to improve the accuracy of assignment choices and access costs, we have undertaken an update to the walk network in the development area.

As the level of development build out and extent differs between the Do-Minimum scenario compared to the Medium and Max Growth scenarios (which are identical in this regard), we have developed two updated walk networks based on the development options.

Figure 4: Walk network – Do-Minimum vs Reference Case incremental change

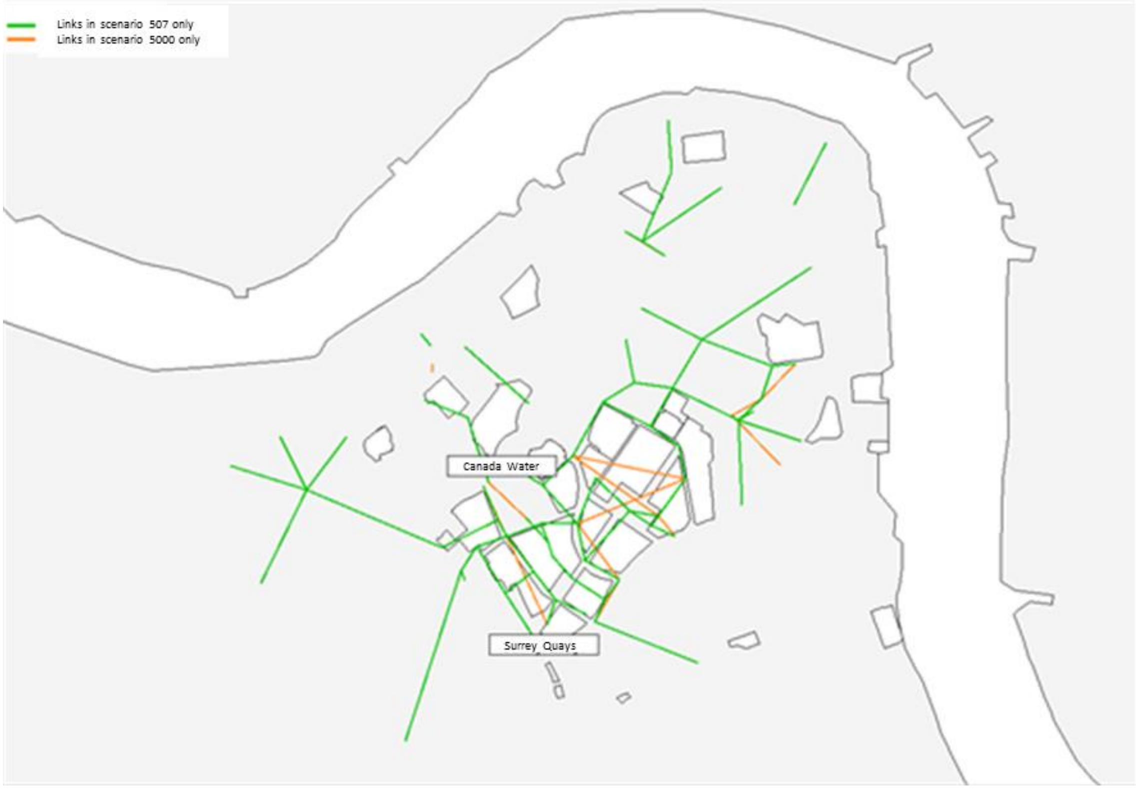
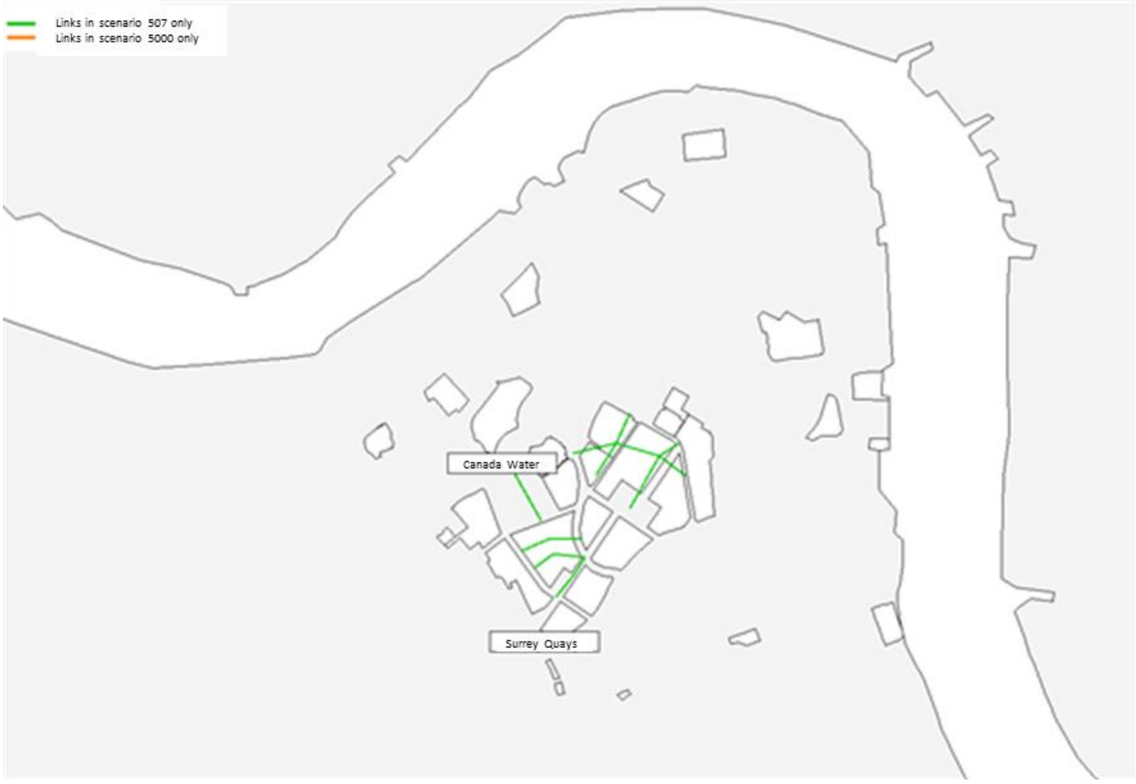


Figure 5: Walk network – Medium vs Do-Minimum incremental change



2.5 Conclusion

Following implementation of the service and walk network changes to the 2031 reference case network, the resulting Do-Minimum and Medium development scenario networks have been assessed as fit for purpose for the Canada Water Strategic Transport Study and have duly been applied in the forecasting (as set out in **Section 7**).

The networks reflect committed and funded schemes in accordance with WebTAG guidance based on the latest plans at the time of development.

3 Highway Future Year Networks

A review of TfL's 2031 and 2041 CLoHAM reference case networks was undertaken to establish the detail provided and relevance in the Canada Water area. Any network changes made during the base year re-calibration exercise have also been included. The resultant networks will be used in both the do-minimum and the development scenarios. As the future year reference cases will be used in these scenarios, no Canada Water specific interventions to mitigate any development demand on the network is present. These will be used to identify any areas of the network that are likely to come under stress following the introduction of the development demand to the area and help determine any required mitigation measures.

3.1 Reference case networks

The 2031 and 2041 CLoHAM P3 reference networks were provided to Mott MacDonald by TfL on 21st March 2017. These networks were used as a starting point for all Canada Water STS forecasting networks. All committed highway transport schemes between 2012 and 2031 have been included in the future year reference case networks.

The following changes were made to the future year networks to keep them consistent with the re-calibrated Canada Water base year networks. These changes were made to the base year network as part of the calibration/validation exercise, each network alteration has been assessed to check if it is still applicable to be applied in the future year network:

3.1.1 Changes to zone loading

Zone connectors were reviewed in the area of interest to make sure that demand in each zone loads on to and off the network in the correct locations. This was done as part of the base year re-calibration exercise and improved the validation of the base year model. Because of this, the following changes were also made to the future year networks.

- A zone representing the residential area next to Sanford Street (zone 24041) appeared to be loading traffic to and from a spigot link which represented Rolt Street (node 24405), this was inaccurate and the connection was removed.
- A spigot link was connected on to Surrey Canal Road (link 24152 to new node 24999) to allow access into zone number 24015 to represent Mercury Way.
- Upon further inspection of the network, it was decided that the following zones' connections onto the network required revision to more accurately reflect the points at which demand could be loaded or unloaded:
  - Zone 26122 – connection to link 26177-26178 removed, connection to link 26194-26195 added
  - Zone 26137 – connection to link 26199-26179 added
  - Zone 24069 – connection to link 24673-24136 removed
  - Zone 24037 – connection to link 24454-24109 added
  - Zone 26133 – connection to link 26442-26277 removed
  - Zone 26132 – connection to links 26567-26566 and 26577-26570 removed, connection to link 26276-26273 added

3.1.2 Changes to signal timings

Signal timings at signalised junctions were reviewed in the area of interest to make sure that they matched average green and inter-green timings for the peak hour. This was done as part of the base year re-calibration exercise and improved the validation of the base year model. Because of this, the following changes were also made to the future year networks.

- The signal timings for the A2/A3 junction at Borough Underground station (node 27038), were changed to 25/0, 9/5, 15/7, 14/5. Two of the arms (Marshalsea Rd and Great Dover St) were approaching capacity at this junction in the model received from TfL; it was anticipated that SCOOT or equivalent systems would balance the delay on other arms and thus adjustments to the signal timings were made to reflect this.
- The pedestrian time on node 24465, a signalised crossing on Evelyn Street, was increased by 8 seconds to allow a more realistic time of pedestrians crossing here.
- Speed flow curves were changed on Vesta Road to 812 for consistency with adjacent links.
- The signal timings for the following signalised nodes were changed to give a more realistic capacity based on the counts that were available:
  - Lewisham Way/Friendly St (node 24136) - cycle time 90s; 48/7, 28/7
  - Evelyn St pedestrian crossing (node 24679) - 60/-28
  - Jamaica Rd/West Lane (node 26456) - 34/6, 11/22, 15/0
  - South Lambeth Rd (node 28488) - 40/5, 48/3
  - Newington Butts/Kennington Park Rd (node 27336) - 30/6, 32/0, 23/5
  - Old Kent Rd/East St (node 26154) - 56/5, 22/5

3.1.3 Changes to saturation flows

Saturation flows were reviewed in the area of interest to make sure that they represented movements at key junctions in the area well and the resultant capacity was reflective of actual conditions. This was done as part of the base year re-calibration exercise and improved the validation of the base year model. Because of this, the following changes were also made to the future year networks.

- The saturation flow representing the turn off the Rotherhithe Tunnel roundabout on to the A101 Rotherhithe Tunnel (turn 26644-26554-20187) was reduced to 1,000 to represent the reduction in capacity here because of the 2m width restriction on the exit of the roundabout.
- The saturation flows for the turns coming from Newington Butts to signalised junction Kennington Park Road/Kennington Lane were reduced due to the Cycle Super highway on Newington Butts reducing the capacity at the junction. The saturation flow from node 27424 to node 27336 was reduced to 1500 for ahead and 1800 for the right turn.
- The saturation flow from the eastern approach to the Shooters Hill Rd/Prince Charles Rd roundabout (node 22614) was increased to 2212 to reflect the 2 lane approach.

3.1.4 Other additional network adjustments

Other aspects of the network were reviewed in the area of interest which have a significant impact on network operation. This was done as part of the base year re-calibration exercise and improved the validation of the base year model. Because of this, the following changes were also made to the future year networks.

- Speed flow curve 913 was added to node 26459 from 27017. This was to represent a link based capacity restriction on Jamaica Road that resulted in queueing downstream for Rotherhithe tunnel.
- The flare length on Lower Road approaching the Rotherhithe tunnel roundabout northbound for the tunnel exit is approximately 85m. Therefore, the stacking capacity at node 26629 was increased to 15 from node 26645.
- Sternhall Lane became pedestrianised in 2012, therefore the signalised junction at Copeland Road/ Peckham Rye/ Sternhall Lane was adjusted to reflect this. The link 26101-26099 was banned.
- A proportion of traffic in the model heading southbound from the Rotherhithe Tunnel towards Old Kent Road appeared to be using Bolina Road which runs next to the Millwall Football Ground (link 26377-26496). Upon further inspection of the link through Google Street View, it appears that the road becomes a narrow single lane through a tunnel and is likely to be used only by local traffic. A 150s penalty was therefore applied to the link to deter traffic from using this route.

3.1.5 Forecasting network review

Network coding in the Canada Water area in the 2031 and 2041 forecasting networks was also reviewed. London Borough of Southwark introduced a Borough wide 20mph speed limit in 2014/2015 i.e. between the base year of 2012 and the forecast years of 2031 and 2041, the 20mph limit includes Lower Road, Salter Road and Rotherhithe Street. The following speed-flow curves have been applied to roads in the Canada Water area, following a review of their characteristics. Speed flow curves to the roads below had been applied by TfL originally but were reviewed following unexpected re-routing of traffic on Lower Road seen in initial Canada Water assignments:

- Lower Road – 820, 20mph S2D2 A-road with low traffic calming
- Salter Road – 822, 20mph S2 minor road with high traffic calming
- Rotherhithe Street – 812, 20mph minor road with high traffic calming
- Redriff Road – 821, 20mph S2D2 B-road with low traffic calming

The speed flow curves described above reflect the likely capacity of a 20mph road in the area better than those in the reference case networks for the four roads named above. The suggested speed flow curves offer slightly more capacity than those allocated in the reference case networks and therefore better reflect the likely operation of Lower Road, Redriff Road and Salter Road in particular.

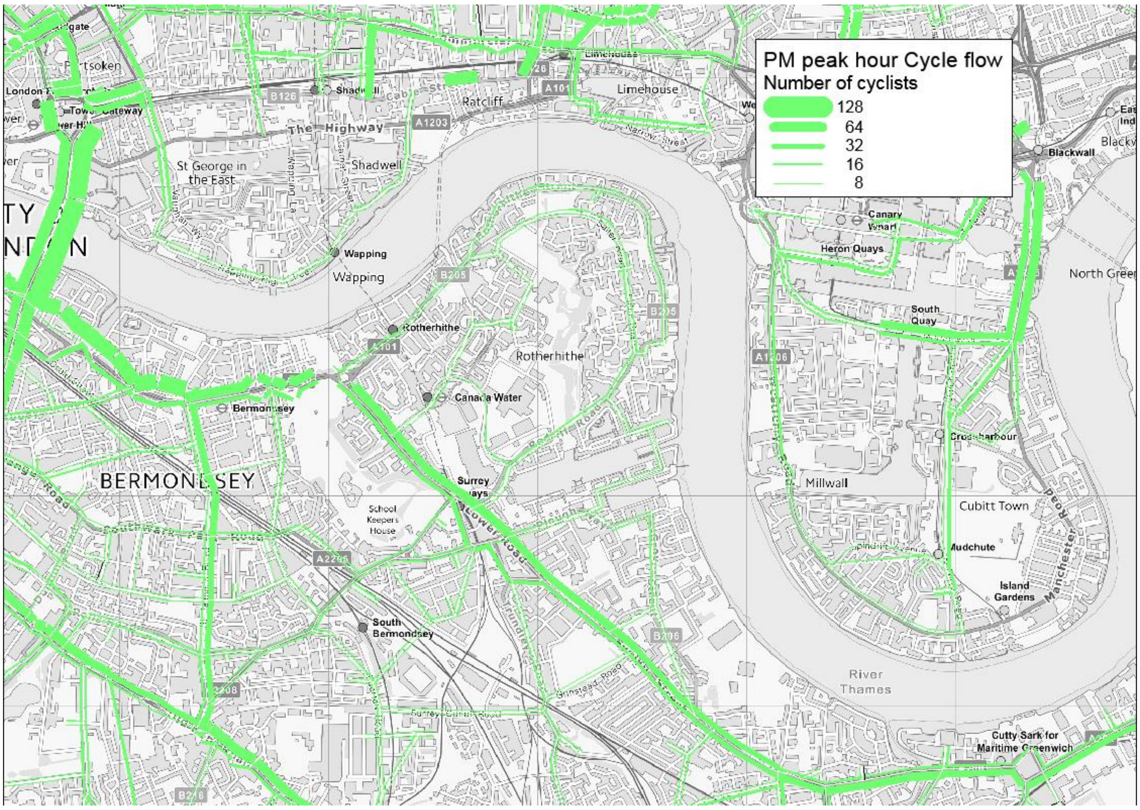
Following initial assignments, it was apparent that the signalised junction between Surrey Quays Road and Lower Road, and the junction between Redriff Road and Lower Road were acting as capacity constraints. Signal timings were therefore optimised at these junctions to allow the additional traffic generated by the development to access Lower Road.

3.1.6 Cycle pre-load

The 2031 reference case models include preload files to be loaded on to the network at the assignment stage containing values of pcus which represent cyclists. **Figure 6** displays the cycling flows to be loaded on to the network before matrix assignment in the PM peak hour in 2031. Each cyclist is given a pcu value of 0.33 i.e. 3 cyclists = 1 pcu.

The plot displays a southbound flow along Lower Road of approximately 150 pcus or 50 cyclists in the PM peak hour, with only 60 pcus or 20 cyclists in the opposite direction. These flows remain reasonably consistent between forecast years 2031 and 2041 with only minor increases in flow (155 pcus or 52 cyclists SB and 64 pcus or 21 cyclists NB). However, the 2012 base year cycle pre-load files give a southbound flow of 82 pcus or 27 cyclists and a northbound flow of 11 pcus or 4 cyclists, this indicates an 85% increase in cycles heading southbound and a 425% increase in cycles heading northbound between 2012 and 2031.

Figure 6: CLoHAM P3 2031 cycle flows



Source: Ordnance Survey data © Crown copyright and database right 2016

3.2 Network detail to accommodate new development

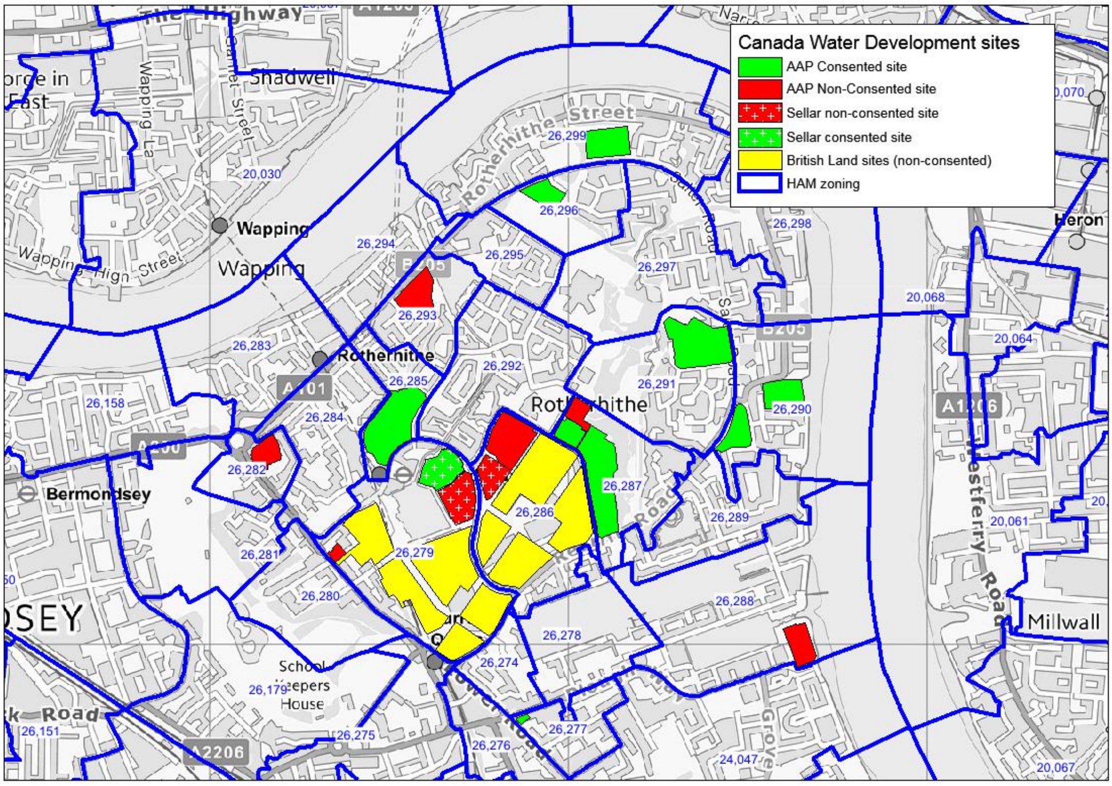
Additional network detail is required to accommodate the access to and from the new development sites. This detail is described below, as most of this detail is reflective of existing network, these updates were applied to both the do-minimum and development scenario for consistency.

3.2.1 Network layout and Zoning system

As described in **Section 1**, the forecasting of traffic has been undertaken using three core scenarios. In order to accurately represent traffic on the network for all 3 development scenarios, the locations where traffic will be loaded on to the network and the geographical area which represents the origins and destinations of trips made have been carefully considered.

Figure 7 displays the locations of all consented and non-consented development sites in the Canada Water area and the suggested geographical areas which should be represented in the model for all three scenarios. The zones were created by considering the location of development sites, as well as the current and proposed road network.

Figure 7: Canada Water HAM zoning



Source: Ordnance Survey data © Crown copyright and database right 2016

Alongside the site plans above, LBS also provided British Land's masterplan, dated 15th March 2017, to inform the study as to how the future road network may be laid out. **Figure 8** displays this masterplan, with the only significant difference to the current layout (when comparing with Google Maps) with regards to access to development sites is the additional access off Redriff Road, between Surrey Quays Road and Quebec Way.

Figure 8: British Land Masterplan – March 2017

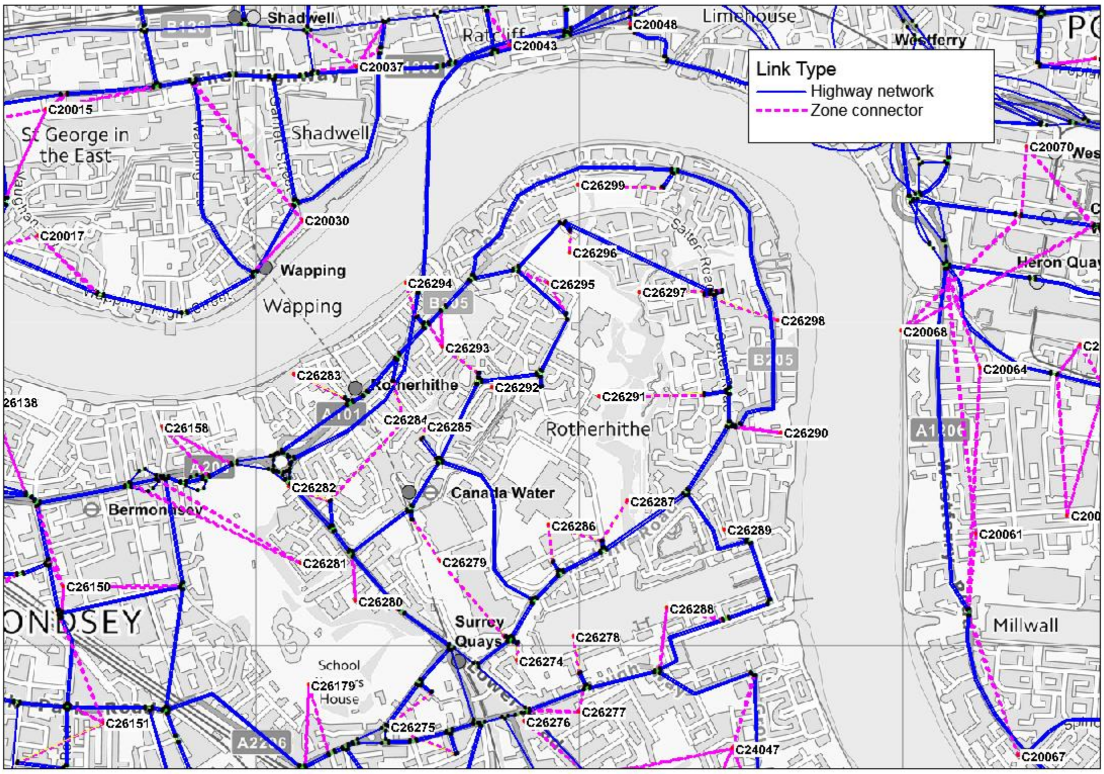
Source: British Land

Figure 9 displays the centroids of the zones displayed in **Figure 7** and the locations at which traffic is able to load on to the network for all three scenarios. Where zones were unchanged from CLoHAM P3, the zone centroids and connectors were also unchanged. Due to the size of the new zones, many contain one minor road which feeds the majority of traffic in this zone onto the existing network. Hence, these have been modelled using spigot links. Where there was more than one minor road, a combination of link connectors and spigot links have been used to best represent the possible traffic routing; zone 26293 is an example of this.

The additional access between Surrey Quays Road and Quebec Way has been included as a spigot link and allows traffic from zone 26286 to be loaded and unloaded on to the network at this location. A spigot link representing Quebec Way has also been included in the Canada Water forecasting network, as this did not exist in CLoHAM P3, and allows access to both zones 26286 and 26287.

Deal Porters Way has been re-aligned in the masterplan and is likely to form a new high street, it has been confirmed that the high street will not be a through route for traffic (except for buses) and will only allow access to retail and residential units. The loading of traffic to and from zone 26279 reflects the fact it will not be a through route, as seen in **Figure 9**. Buses that would be using this as a through route will use the junctions at either end of Deal Porters Way on Surrey Quays Road and Redriff Road, and hence will still be interacting with traffic.

Figure 9: Canada Water HAM zone connectors



Source: Ordnance Survey data © Crown copyright and database right 2016

Following the implementation of all updates described above, subsequent reviews of the network indicate that the forecasting network reflects likely network operation well and is suitable for highway forecasting requirements.

4 LTS Input Specifications

4.1 Introduction

LTS is the multimodal demand model within TfL’s strategic transport modelling suite. LTS uses numerous demand drivers including land use, socio-economic forecasts and transport supply to calculate future trip generation, trip distribution and mode choice. The trips that LTS calculates are then assigned to more detailed strategic networks and zoning in Railplan (public transport) and HAM (highway) models to forecast detailed route choice and cost changes between transport and land use scenarios.

Figure 11 provides an overview of the strategic modelling suite and linkages between LTS, Railplan and HAM.

Figure 10: Overview of TfL Strategic Modelling Suite

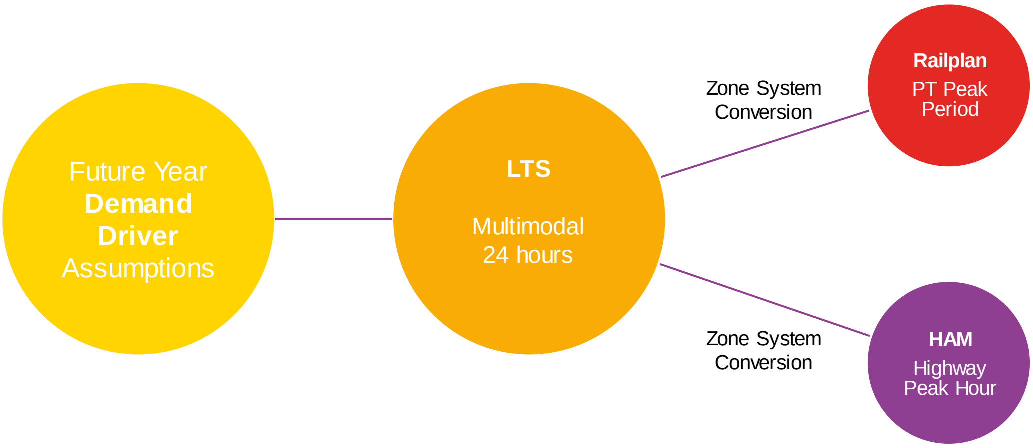


Table 9 summarises the key LTS inputs that have been defined for the Canada Water STS and their influence on the modelling. More detail on these inputs are shown in the rest of this section.

Table 9: Summary of Key LTS Inputs

Input	Influence
Households	Trip Generation and Distribution
Population	Trip Generation
Employment	Trip Generation and Distribution
Parking	Mode Choice
Schools	Attractions, Mode Choice
Car Ownership	Mode Choice
Retail Floorspace	Attractions
Transport Network	Mode Choice
Input	Influence

4.2 Do-minimum scenario

4.2.1 Overview of Approach

The Do Minimum scenario forms the baseline for this study against which test scenarios have been compared. It represents the best estimates of conditions and trip making in 2031 by combining 2011 LTS inputs and currently consented development specifications in the OA area, combined with 2031 trends across the wider London area.

This scenario supersedes the use of the 2031 LTS reference case. A single LTS zone which represents the Canada Water area, zone 1101 (see **Figure 11**), has been updated by utilising more up to date and site-specific input assumptions, though the 2031 trends mentioned previously are sourced from the reference case assumptions.

The Do Minimum scenario as used for the STS and reported here is run A131CW06.

4.2.2 Households, Number of Jobs, Retail Floorspace

Base and consented development assumptions for households, number of jobs and retail floorspace have been provided by LBS and applied to the zone of interest. The number of households in 2011 in the zone of interest is 4,971 with a net increase in the 2031 do-minimum scenario of 1,705, resulting in 6,676 homes.

LBS provided MM with jobs and retail floorspace on all consented development sites in the format of gross internal area (GIA), with the exception of Sellars' consented development site which was given in gross external (GEA) area format. Paragraph 2.12 of the Employment Density Guide[3] suggests a benchmark reduction of 5% to convert from GEA to GIA, so this was applied to Sellars' consented development site.

The number of jobs has been calculated based on the amount of job specific floorspace (GIA) e.g. B1 office space and also retail floorspace e.g. A-class (shops, food & drink and services). **Table 10** displays the assumed employment densities used when converting from retail or jobs floorspace to number of jobs.

Table 10: Employment Density

	Use class	Floorspace per worker (m2 of GIA) - Inner London
Business	B1	11.3
Industrial	B2	36
Storage & Distribution	B8	36
Shops, food & drink, services	A-class	17.5
Other	Other	45
Cultural attractions	D2	60

Source: https://www.london.gov.uk/sites/default/files/lesd_final_report_may-2016.pdf

After taking all job specific and retail floorspace into account, the consented development adds 767 jobs on to the existing 3,886 jobs in the zone of interest to give 4,653 jobs in the 2031 do-minimum scenario.

[3] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/484133/employment_density_guide_3rd_edition.pdf

4.2.3 Population

Population has been derived from households, based on future household occupancy levels assumed in the zone of interest in the 2031 LTS reference case. As such, the 2031 assumption of 2.00 people per household has been applied to the 2011 and consented development household assumptions. The population in 2011 in the zone of interest is 9,953 with a net increase in the 2031 do-minimum scenario of 3,414, resulting in a population of 13,367.

4.2.4 Blue Collar/White Collar Jobs Split

It has been specified that of the total number of jobs in the do-minimum, 30% will be blue collar and 70% will be white collar. This assumption is based on London-wide trends of new developments.

4.2.5 Car Ownership per Head

The car ownership ratio has been calculated by applying the 2031 reference case assumption of 0.26 cars per head in zone 1101 to the 2011 population and applying an assumption of 0.2 cars per household to consented developments. 0.2 cars per household (or 0.1 cars per head using the 2.00 people per household assumption) is taken from Sellars consented site information[4], which states that the development will provide 1 space for every 5 homes. It is assumed that all other consented development sites will offer the same ratio.

The car ownership per head is calculated as a weighted average of existing and consented development which gives 0.22 cars per head.

4.2.6 Number of School Pupils by Type

Planned school capacity by type (primary, secondary and tertiary) in 2031 has been advised by LBS. The number of school places expected to be made available following consented development is 2,670. This is an increase from the 2011 LTS assumption for the zone of interest which is 2,138.

This input assumption relates to the number of school spaces in the zone, not the number of school children residing in that zone (which is a function of the unchanged demographic assumptions found in the 2031 reference case). As such, these school places may be filled by those outside the study zone.

4.2.7 Parking

LTS zone 1101 falls outside of LB Southwark’s controlled parking zones (CPZ) and therefore no data on the number of available parking spaces in the zone of interest has been provided for the study. The LTS base year and 2031 reference case numbers, as seen in **Table 11**, have been reviewed against satellite imagery and have been accepted as being reasonably accurate and so are unchanged for the do-minimum scenario.

Table 11: Zone 1101 parking spaces

Year	Public on-street Parking	Private non-residential parking	Private residential parking	Public off-street parking	Total
2011	96	471	4525	1772	6864
2031	96	377	4525	1772	6770

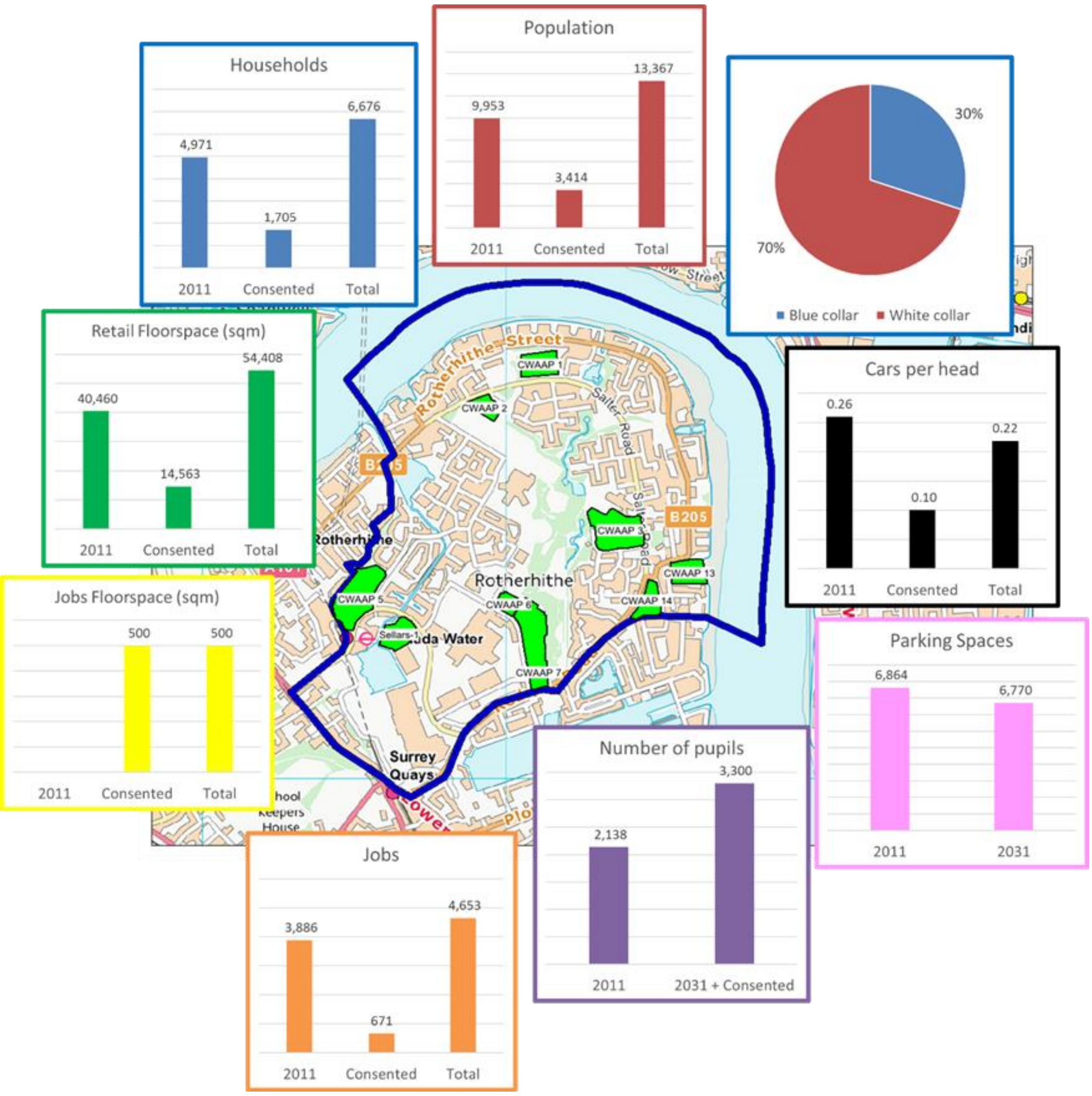
[4] http://www.sellarcanadawater.com/c-and-g-sellar.pdf

Figure 11 shows the LTS zone being re-specified, the location of consented developments and the inputs assumptions for LTS. Note, there are development sites scattered outside of the LTS zone shown, however, these are much smaller sites and investigations have proven that reference case assumptions account for these sites. As such, in these zones, the 2031 reference case assumptions are unchanged.

The following consented development sites are therefore included in the 2031 do-minimum scenario (see **Figure 11**):

- CWAAP 1
- CWAAP 2
- CWAAP 3
- CWAAP 5
- CWAAP 6
- CWAAP 7
- CWAAP 13
- CWAAP 14
- Sellars-1

Figure 11: Summary of Do Minimum LTS Specifications



Source: M:\381801 - Canada Water OAPF\04 Analysis\05 LTS inputs\120617 CW site progress MM1 FINALv9Plots.xlsx

4.3 Medium Development scenario

4.3.1 Overview of Approach

The medium growth scenario is based on the do-minimum scenario and will include all consented and non-consented development sites. This includes development sites which are currently in the planning stage and preparing for an application, such as those owned by British Land and Sellar.

The Medium Development scenario as used for the STS and reported here is run A131CW07.

4.3.2 Households, Number of Jobs, Retail Floorspace

The number of non-consented households for this scenario was provided by LBS following verification from British Land/Arup for the British Land owned development sites. These households will be added on to the base year (existing) and consented number of houses as described in **Section 4.2.2**. The number of non-consented homes has been confirmed as 6,031, giving a total of 12,707 homes in the zone of interest.

The non-consented development sites are expected to introduce 265,360 square metres of additional job specific floorspace along with 54,770 square metres of additional retail floorspace. This results in an additional 26,612 jobs in the zone of interest, on top of the do-minimum as described in **Section 4.2.2**, giving a total of 31,265 jobs.

4.3.3 Population

Applying the same assumption of 2.00 people per household as the do-minimum scenario to the 12,707 homes described in Section 4.2.1 gives a total population of 25,444 in the zone of interest.

4.3.4 Blue Collar/White Collar Jobs Split

The same 70% white collar, 30% blue collar split from the do-minimum will be applied to this scenario.

4.3.5 Car Ownership per Head

Similarly to the do-minimum scenario, we have accounted for differing assumptions for development stages; existing population is assumed to use the LTS reference case assumption of 0.26 cars per head, consented developments are assumed to have 0.1 cars per head, British Land developments are assumed to have 0.15 cars per head and all other non-consented development uses the LBS advised target of 0.05 cars per head.

This therefore gives an overall weighted average of 0.17 cars per head for the zone of interest.

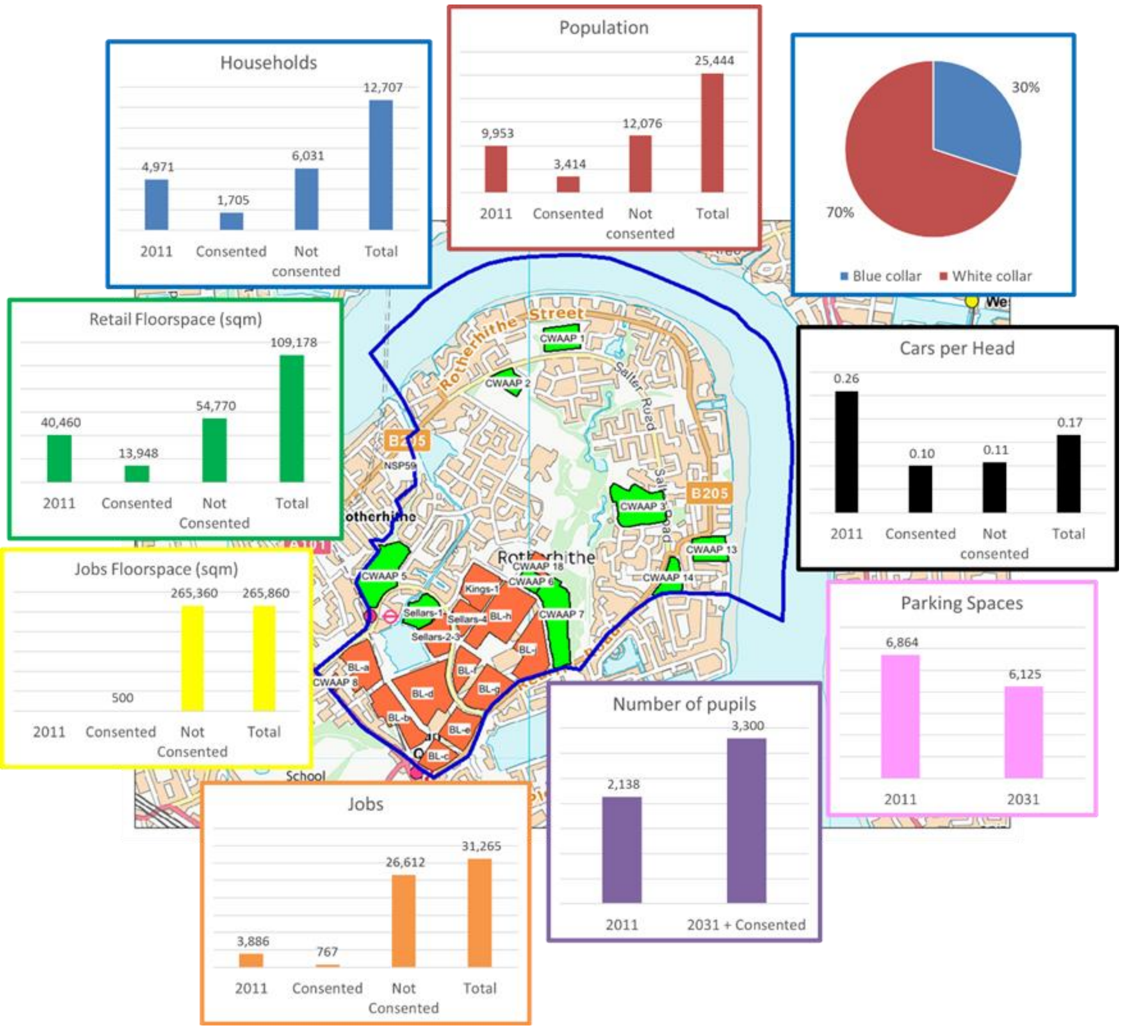
4.3.6 Number of School Pupils by Type

LBS provided MM with an estimated number of pupil places for 2031 given a medium level of development growth; this number was 3,300 pupil places and was input to the LTS model.

4.3.7 Parking

British Land/Arup have advised that there are currently 1,950 public off-street parking spaces which serve the Surrey Quays Shopping Centre and the Surrey Quays Leisure Park, with this number planned to be reduced to 1,240 spaces. This total figure of 1,950 differs slightly from the value of 1,772 used in the do-minimum for the zone of interest; therefore, to be consistent with the do-minimum, a reduction factor of 1,240/1,950 = 0.65 was applied to 1,772 to give 1,127 public off-street parking spaces. This results in a total number of 6,175 spaces for this scenario.

Figure 12: Summary of Medium growth scenario LTS Specifications



Source: M:\381801 - Canada Water OAPF\04 Analysis\05 LTS inputs\120617 CW site progress MM1 FINALv9Plots.xlsx

Note: Jobs Floorspace (sqm) figures are not available for 2011, hence are displayed as zero, but that is not to suggest the study assumed there are no jobs in the 2011 models.

4.4 2041 Max Growth

The 2041 Max growth scenario assumes the same inputs as the Medium Development scenario described above for the Canada Water OA zone. For the rest of London, input assumptions are as per 2041 background growth plus maximum OA development potential across all other OAs[5].

4.5 LTS Outputs and Assignment Modelling

The LTS inputs detailed in this section have been run through the LTS model. The result is an Origin-Destination matrix that accounts for trip generation, distribution and mode choice based

[5] 2041 Max Growth run based on A141rc20

on the production, attraction and supply assumptions in each scenario. A summary of these trips are shown in Table 12.

Table 12: LTS Outputs - Morning Peak (3hr) Person Trips in the GLA area

	Public Transport	Highway	Active
Do Minimum (A131CW06)	3,187,320	1,868,400	1,813,957
Medium Growth (A131CW07)	3,194,346	1,868,682	1,819,154

Source: Top Line Stats table 2.1a

These matrices have then been converted for use in Railplan and HAM. The conversion process and resulting assignment matrices – detailed in Sections 5 and 6 respectively – accounts for conversion to 3 hour AM peak period for public transport modelling and peak 1 hour for HAM modelling and conversion to the assignment models' more detailed and disaggregate zoning systems.

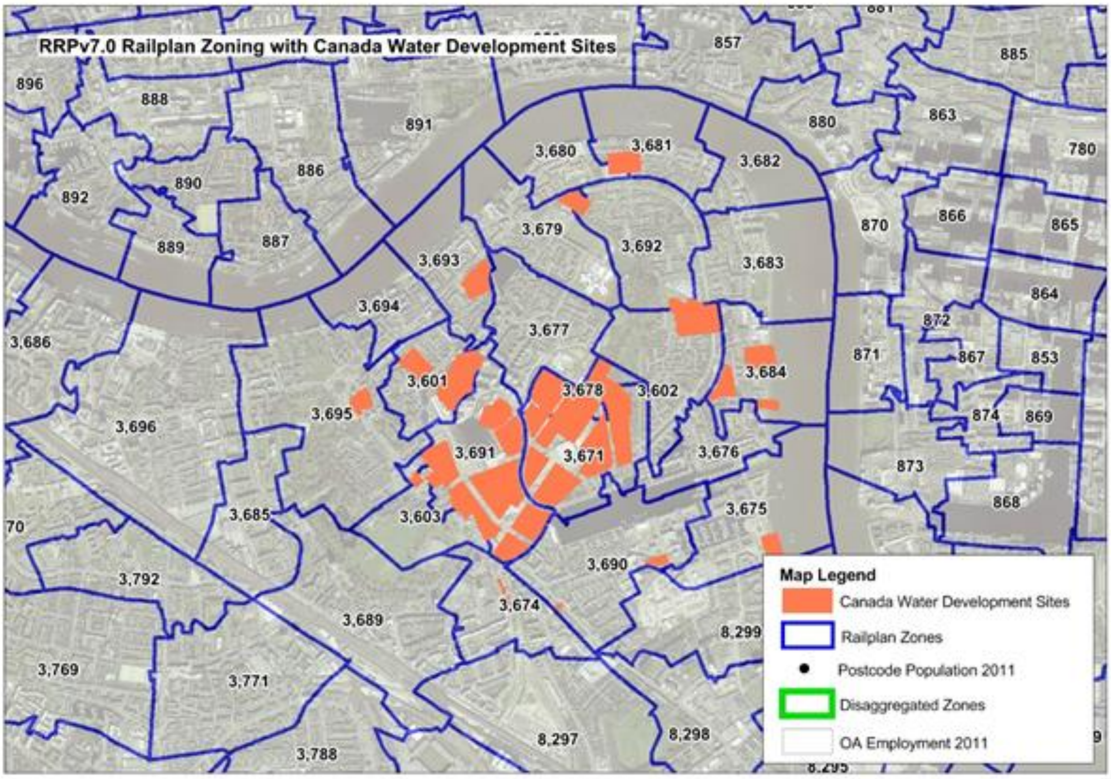
Note, Active trips (walking and cycling) are not subject to any further assignment or analysis.

5 Public Transport future year demand matrices

The standard zoning structure in Railplan contains 4106 zones of varying geographical size; with smaller, more disaggregated zones in the centre of London, becoming coarser outside of the Greater London Area.

Figure 13 shows the zone structure in the vicinity of Canada Water against the proposed development sites. The structure is sufficiently detailed to allow for splitting of different components of the development into separate zones. However, the zone structure around the bulk of the development (around Canada Water Station) is not sufficiently detailed to allow for separation of the development from other land-uses and to accurately model access to and from competing PT services. In particular, zones 3678 and 3694 encompass wide areas including land covered by the development and other uses.

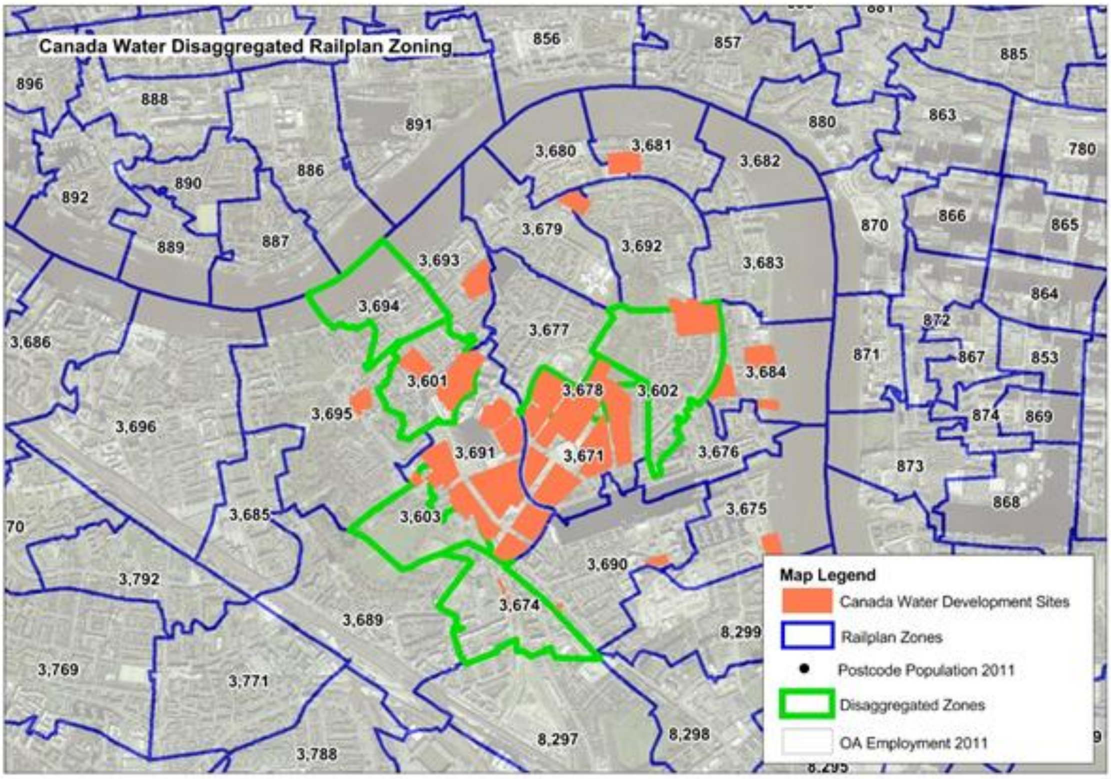
Figure 13: Railplan zoning structure around Canada Water



To better reflect the expected layout of development plots, we have undertaken a zone disaggregation exercise, splitting three existing zones in the area of interest into a more granular zonal geography; this has resulted in 3 additional zones in this area for a total of 4109

Railplan zones. Further details are available in the Local Model Validation Report[6]. The resulting zone structure is shown in **Figure 14**.

Figure 14: Canada Water disaggregated Railplan zoning



The LTS zoning system is considerably coarser than the Railplan zoning. Additionally, the two systems do not have consistent boundaries. LTS matrix outputs are subjected to a standard conversion process to assign demand to the standard 4106 Railplan zone structure. However, in the case of a known future year land use change such as at Canada Water, any changes input into LTS are effectively spread over existing Railplan zones in predefined proportions due to the standard process, which is based on 2011 distributions of domestic and non-domestic address points. So the impact of the X homes in the Medium scenario will be distributed more thinly and across a wider area than where we know those homes should be concentrated.

In order to populate our Canada Water specific disaggregated zones accurately to reflect the development densities we have also undertaken a further process of re-proportioning trips to and from Canada Water and surrounding areas.

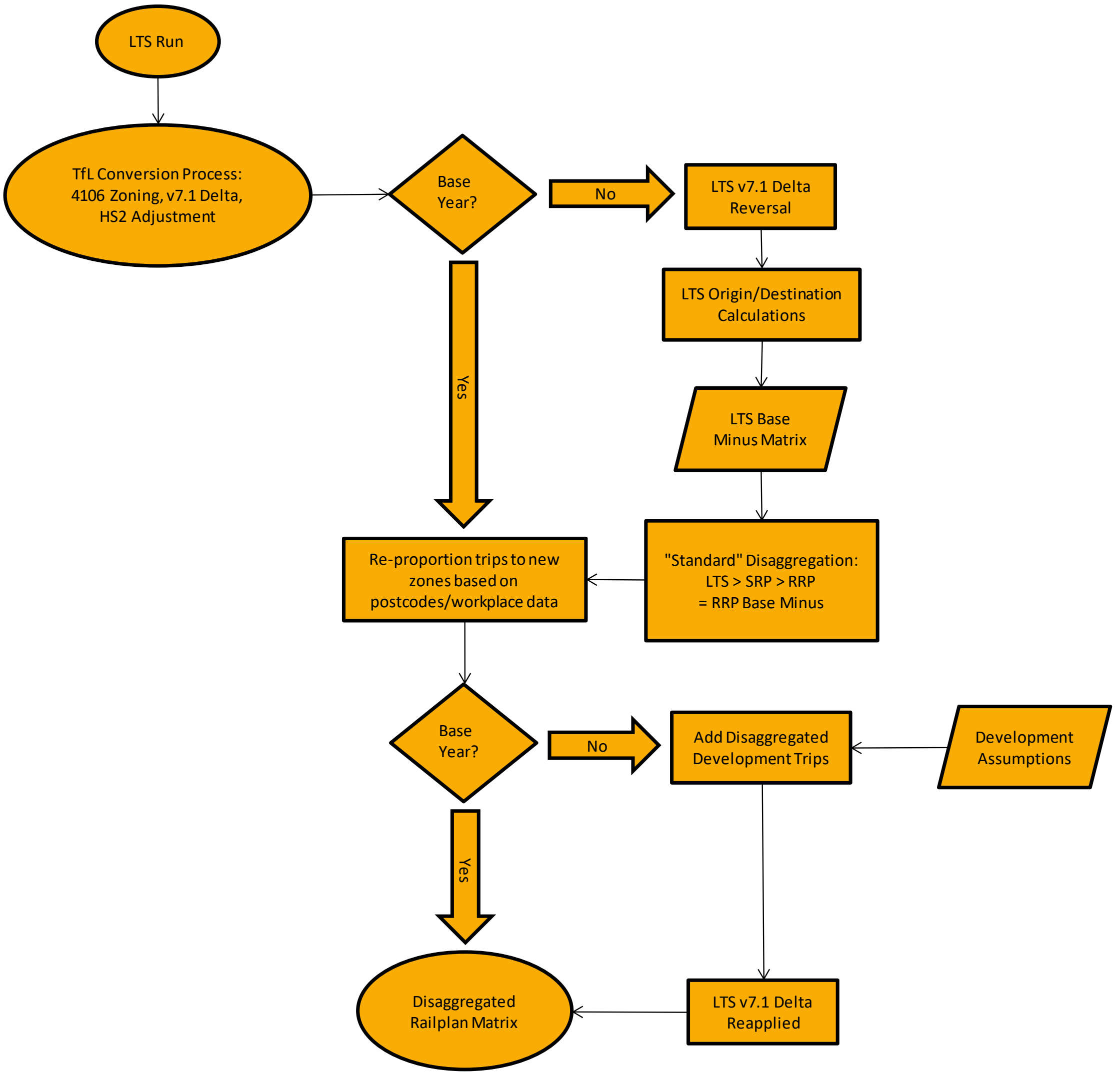
A set of factors were applied to origins and destination trips in Canada Water and related zones to ensure trips from Canada Water Opportunity Area households were allocated to the correct Railplan zones as far as possible, minimising information loss in the standard LTS-Railplan conversion process.

[6] CanadaWater_STS_RP_LMVR_2a_v1.docx

5.1 Disaggregation process

The following Flow Diagram gives an overview of the disaggregation and reproportioning process:

Figure 15: Railplan disaggregation process



In summary, the process to disaggregate a future year matrix is as follows:

5. LTS v7.1 Base Year trips are removed from future year input matrices (as v7.1 is not validated) and LTS v7.0 Base Year trips are added (to produce a “Delta Reversal” matrix).
6. An LTS Base Minus matrix is produced (where all the development is assumed to go into zone 1101) based on proportions of households and jobs.
7. Standard LTS > Strategic Railplan > Regional Railplan disaggregation is undertaken, which produces a Railplan Base Minus matrix.

8. The remaining trips i.e. the difference between the “Delta Reversal” matrix and the Railplan Base Minus matrix, are then added in based on the distribution of masterplan housing and employment sites. Different distributions exist according to the development scenario i.e. Do-Minimum, Medium, and British Land.
9. The delta process is re-applied i.e. LTS v7.0 Base Year trips are removed and v7.1 trips are re-added.

5.1.1 Max Growth

The 2041 Canada Water Max Growth scenario (and subsequently, the 2041 Strategic Full Mitigation package) consist of Medium development on the Canada Water peninsula, and Max Growth elsewhere in London. Therefore, this matrix can be disaggregated using the same process as the 2031 Medium scenario. The only change required is to use 2041 Max Growth Reference Case trip end data (obtained from LTS run A141rc20) and planning data (obtained from A141rf10).

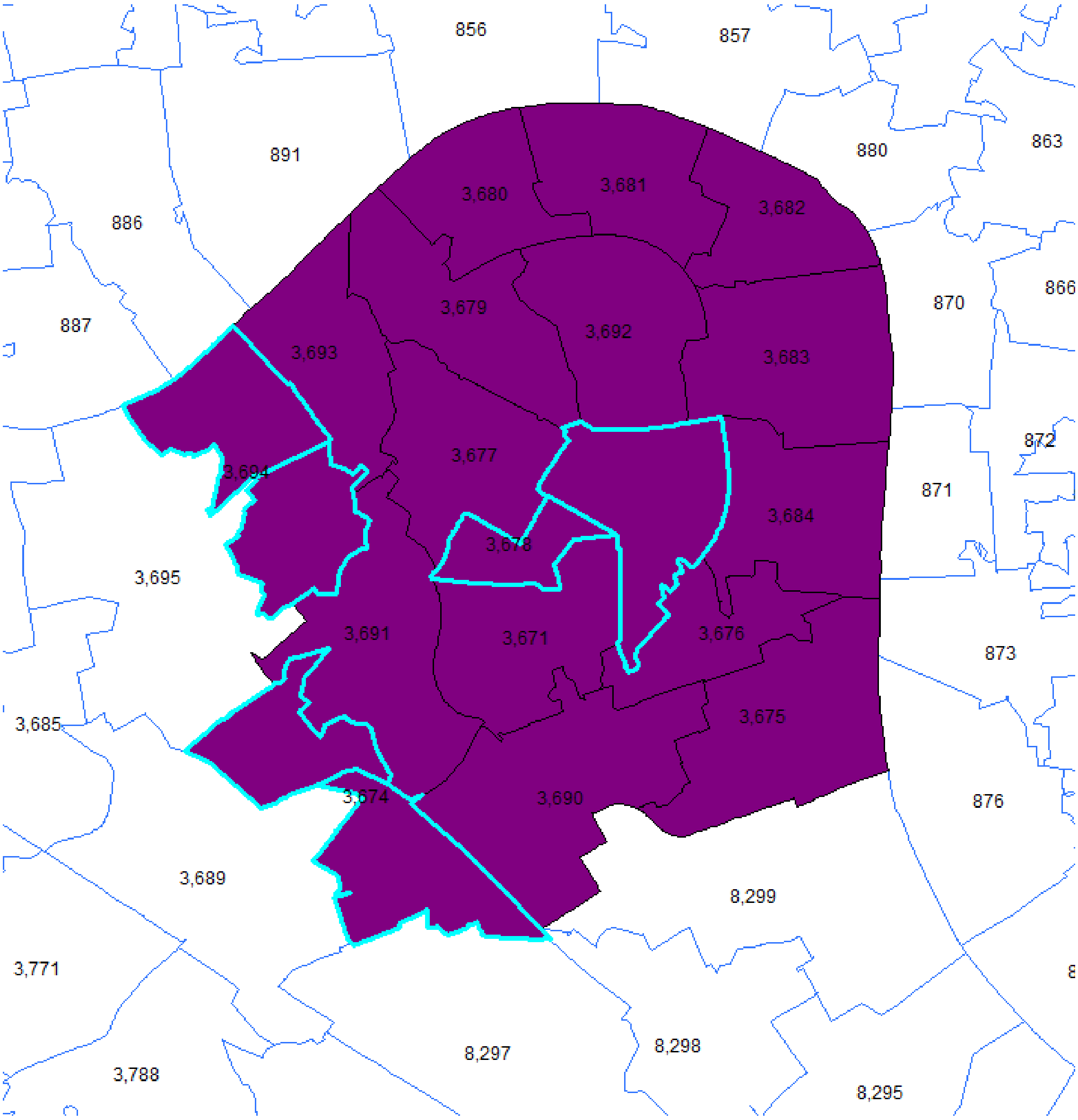
5.1.2 2031 Strategic Lite with BLE Mitigation scenario

For the 2031 Strategic Lite with BLE Mitigation package, an LTS test has been run incorporating Medium development trip ends and various transport schemes such as BLE and Overground frequency increase. It is envisaged that using the previously mentioned disaggregation process would result in the distribution of trips being skewed by the new transport schemes, as opposed to the masterplan development.

Therefore, a different approach has been undertaken to disaggregate and reproportion the Railplan matrix:

1. The difference between the Strategic Lite and Medium development (post-delta adjustment, pre-disaggregation) Railplan matrices is taken to isolate the impact of the new transport schemes.
2. For Railplan zones in the Canada Water peninsula (**Figure 16**), the difference is reproportioned according to the Medium development (post-disaggregation) trip end distribution. For all other zones there is no change.
3. The difference matrix, now reproportioned and disaggregated, is added to the disaggregated Medium development Railplan matrix.

Figure 16: Rotherhithe peninsula Railplan zones used for re-proportioning transport impact trips



Subsequent analysis however showed that this process produced similar results to the process outlined in 5.1 and so for the Strategic Full Mitigation package, the original disaggregation process was used. Matrix sense checks were conducted on the disaggregated and re-proportioned matrices to assess their feasibility for use in further modelling. The results of these checks are detailed in the following sub section. The checks performed are as follows:

- Matrix totals and Canada Water Development Area submatrix totals;
- Canada Water Development Area Public Transport Mode Shares; and
- Canada Water Development Area Public Transport Trip Distribution Plots.

5.1.3 Matrix totals

Note, the tables below include matrix totals for Mitigation tests that have been run through LTS, as well as the core models.

Table 13: Railplan matrix summaries

	A102	A311	A312	A316	A412	A413
	2011 AM Base Year	**2031 AM Do Minimum**	**2031 AM Medium**	**2031 AM Strategic Lite with BLE**	**2041 AM Max Growth**	**2041 AM Strategic Full**
Matrix Total	2,467,454	3,396,452	3,403,368	3,405,756	3,771,674	3,832,422
From Dev Area	2,085	3,227	7,342	7,519	7,543	8,040
To Dev Area	648	2,824	13,177	13,886	13,543	14,646
Within Dev Area	25	100	477	477	460	467

Table 14: Trips from Canada Water development area by zone

	A102	A311	A312	A316	A412	A413
Railplan Zone	**2011 AM Base Year**	**2031 AM Do Minimum**	**2031 AM Medium**	**2031 AM Strategic Lite with BLE**	**2041 AM Max Growth**	**2041 AM Strategic Full**
3601	671	1,016	988	1,009	1,234	1,247
3691	538	846	2,814	2,884	2,795	3,023
3678	409	534	1,474	1,510	1,454	1,559
3671	465	831	2,065	2,116	2,060	2,212
	2,085	**3,227**	**7,342**	**7,519**	**7,543**	**8,040**

Table 15: Trips to Canada Water development area by zone

	A102	A311	A312	A316	A412	A413
Railplan Zone	**2011 AM Base Year**	**2031 AM Do Minimum**	**2031 AM Medium**	**2031 AM Strategic Lite with BLE**	**2041 AM Max Growth**	**2041 AM Strategic Full**
3601	167	305	251	264	479	480
3691	236	1,876	6,744	7,107	6,821	7,398
3678	80	229	1,375	1,449	1,378	1,493
3671	165	414	4,807	5,066	4,865	5,275
	648	**2,824**	**13,177**	**13,886**	**13,543**	**14,646**

5.1.4 Mechanised mode shares

Table 16 shows the mechanised mode share of trips to and from the Rotherhithe Peninsula in the Do Minimum and Medium Development scenarios. Mechanised mode share includes highway and public transport (all PT sub modes combined) trips but excludes walking and cycling. The figures are shown for the AM and PM 3 hour peak periods, and are derived from LTS outputs.

Table 16: Mechanised Mode Share

	Morning Peak		Evening Peak	
	Do Minimum	Medium Development	Do Minimum	Medium Development
Highway Origins	14%	17%	18%	14%
PT Origins	86%	83%	82%	86%
Highway Destinations	19%	16%	19%	19%
PT Destinations	81%	84%	81%	81%

Source: LTS Trips Ends

In both the morning and evening peak, and for trip origins and destinations, public transport is the dominant mode share on the peninsula, accounting for approximately 80-85% of trips. Given the excellent north/south and east/west public transport connections this is not surprising, and whilst positive in comparison to wider London mode share targets, does therefore present challenges to the public transport network.

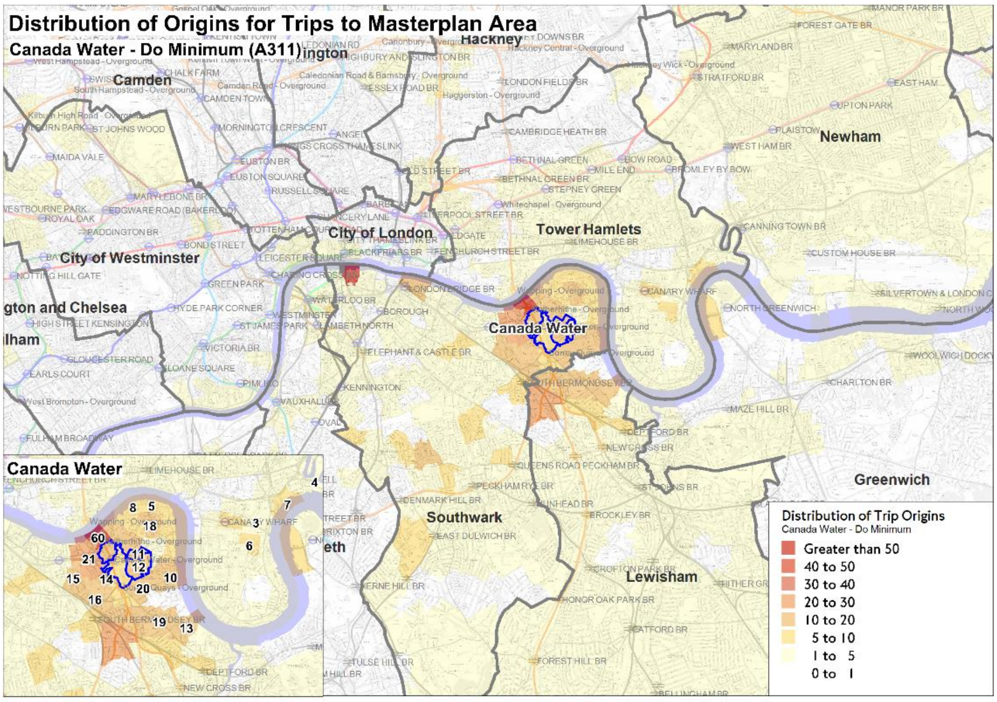
Variations between the Do Minimum and Medium Development scenarios are relatively small, +/- 3% points on average, owing the combination of mixed land use change and OA specific car usage drivers such as ownership levels.

5.1.5 Public transport trip distribution plots

Figure 17 to **Figure 20** show the distribution of trips to and from the OA in the Do Minimum and Medium Development scenarios in the AM peak period. All of the distribution trends appear sensible;

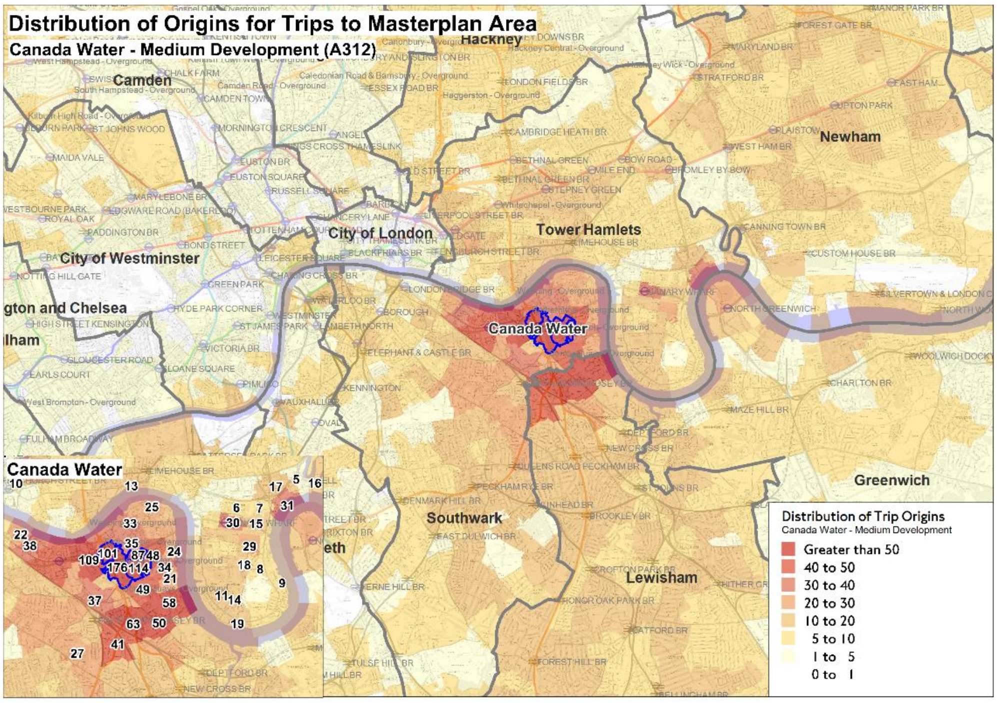
- A relatively broad distribution of trips travelling to the OA with a strong local catchment and wider distribution aligned to Jubilee Line and East London Line routes.
- A significant increase in the quantity of trips travelling to the OA in the Medium scenario resulting from the substantial jobs increase over Do Minimum.
- A strong pattern of trips travelling from the OA to key employment destinations including the City of London, the West End, and the Isle of Dogs.
- A less pronounced increase in trip making from the OA compared to that of trips to the OA, but still a notable increase and particularly in the number of destinations within the OA itself.

Figure 17: Distribution of PT Trips travelling To the OA – Do Minimum



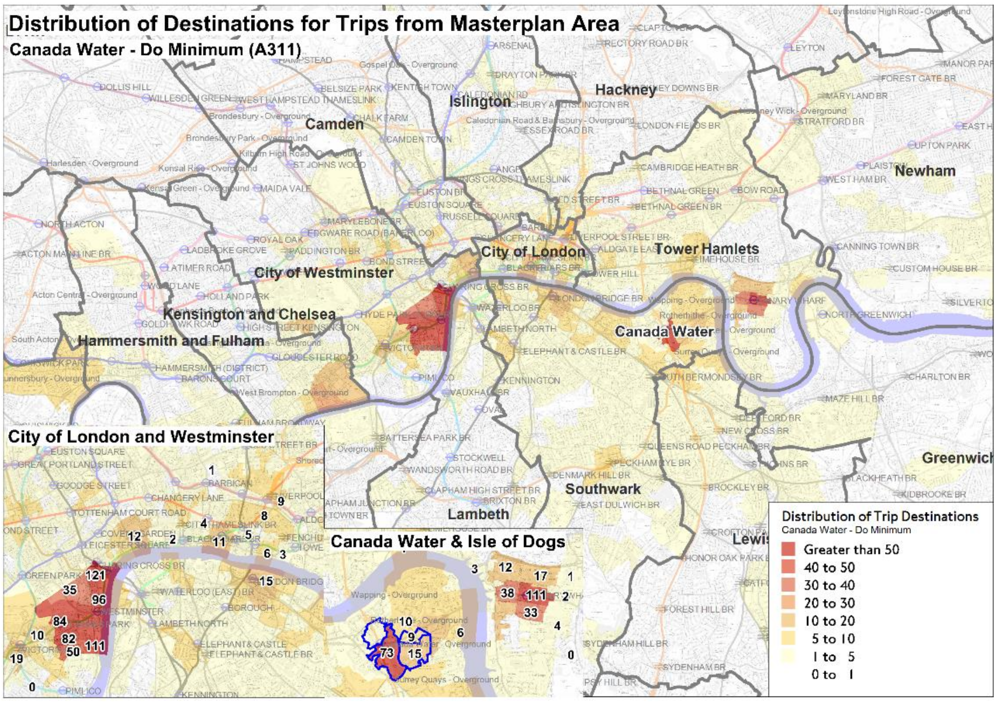
Source: Railplan matrix A311

Figure 18: Distribution of PT Trips travelling To the OA – Medium Development



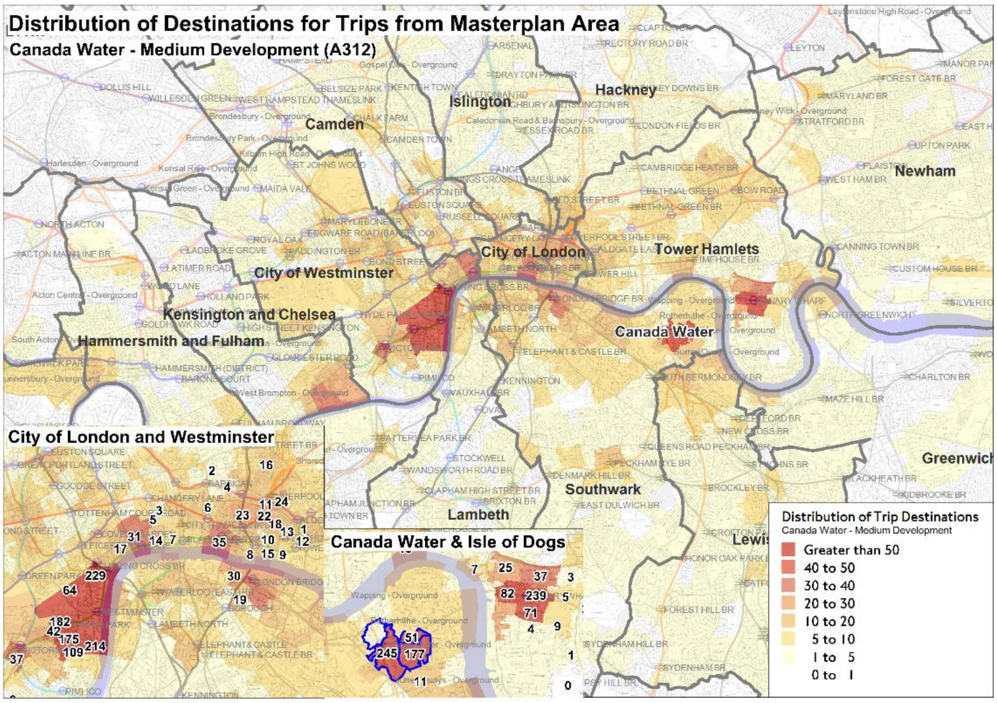
Source: Railplan matrix A312

Figure 19: Distribution of PT Trips travelling From the OA – Do Minimum



Source: Railplan matrix A311

Figure 20: Distribution of PT Trips travelling From the OA – Medium Development



Source: Railplan matrix A312

6 Highway future year demand matrices

Development information, provided by LBS, has been fed into TfL's LTS demand model and converted into CLoHAM P3 matrix format. The conversion of highway transport demand from LTS output into HAM format does not take the locations of the new development into account as LTS zones are too large to allow for such specificity. Due to this, the ends of trips i.e. origins and destinations, which arrive in or leave the Canada Water area has been re-proportioned according to the zonal structure displayed in **Figure 7**.

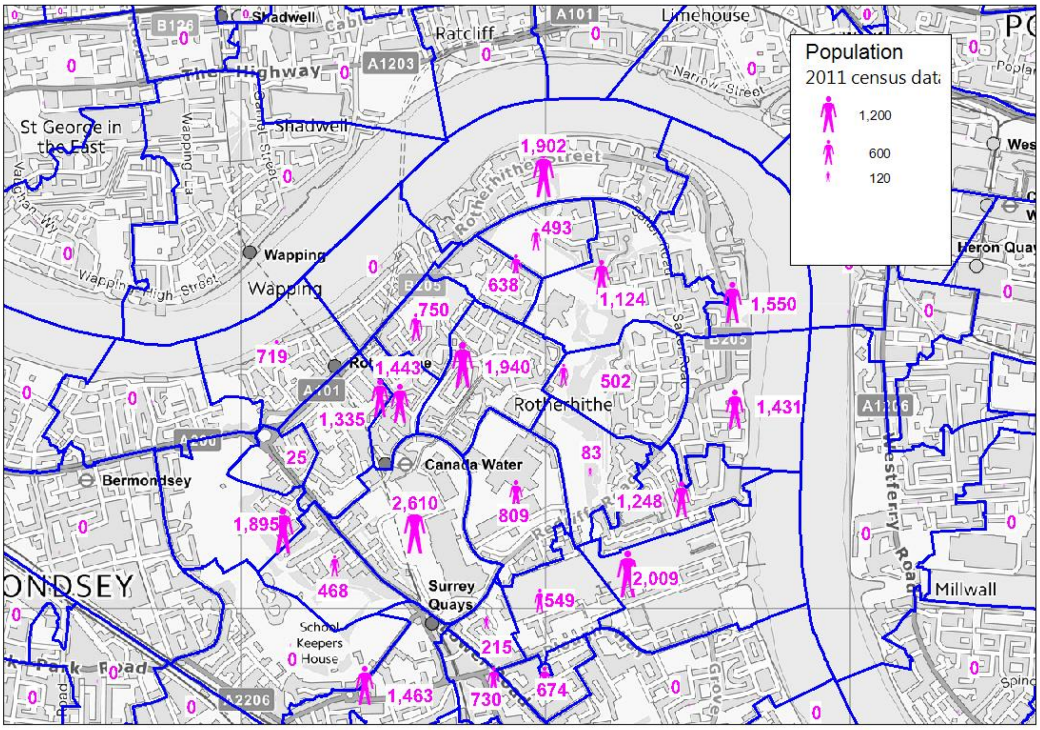
In order to accurately re-proportion trip ends in the Canada Water area following LTS matrix production, both existing data and development assumptions have been taken into account to disaggregate the existing CLoHAM zoning system appropriately. TfL have provided the number of households in 2011 at a postcode level and workplace population data at an output level was sourced from nomis[7], to calculate suitable proportions of trip ends for each of the zones in **Figure 7**.

6.1 Existing population and car ownership

The total number of homes for each postcode provided by TfL were allocated to a Canada Water zone and translated into population based on the average people per household, as given in the 2011 LTS base year. The average people per household in the LTS base year for the peninsula was given as 2.24, this was applied and the 2011 population for each Canada Water HAM zone is displayed in **Figure 21**.

[7] https://www.nomisweb.co.uk/

Figure 21: 2011 census population



Source: Ordnance Survey data © Crown copyright and database right 2016

Average car ownership for the Canada Water area was also extracted from the LTS 2011 base year and was found to be 0.26 cars per person. This ratio was applied to the population above to give an estimated number of car owners for each HAM zone. The proportion of car owners for each zone has been used for the disaggregation process rather than the number of homes as new development plots are likely to have differing levels of car parking provision.

The resultant car ownership levels for each zone has been used as a basis for the distribution of the destinations of all trips arriving in the Canada Water area in the PM peak hour, with the net change in car ownership as a result of the new development being applied to each zone for each scenario.

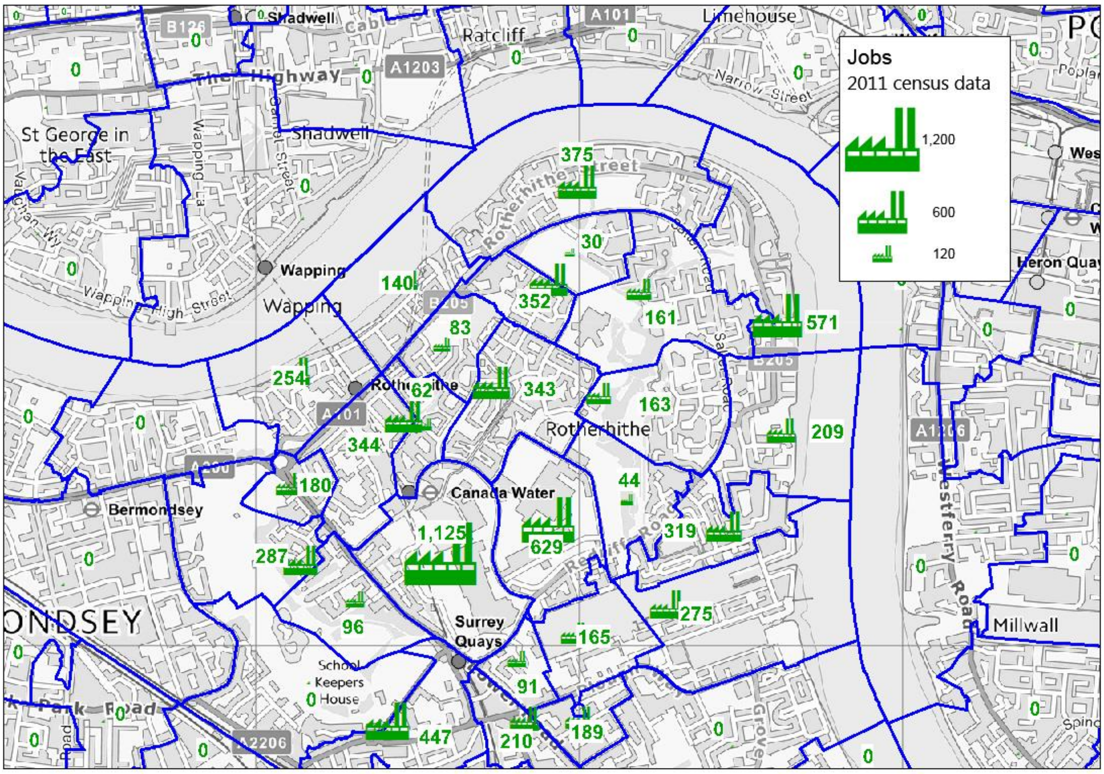
6.2 Existing Jobs

Workplace population data was downloaded from the nomis website[8] at an 'output area' (OA) level. The OA is the lowest geographical level at which census estimates are provided, according to the Office for National Statistics (ONS)[9]. The output areas are small enough to fit inside the new HAM zoning structure and the 2011 workplace population can therefore be allocated to each zone, as displayed in **Figure 22**.

[8] https://www.nomisweb.co.uk/

[9] http://webarchive.nationalarchives.gov.uk/20160105160709/http://www.ons.gov.uk/ons/guide-method/geography/beginner-s-guide/census/output-area--oas-/index.html

Figure 22: 2011 census jobs



Source: Ordnance Survey data © Crown copyright and database right 2016

The number of jobs in each zone, shown above, will be used as a basis to distribute the origins of all trips leaving the Canada Water area in the PM peak, with the net change in jobs as a result of the new development being applied to each zone for each scenario.

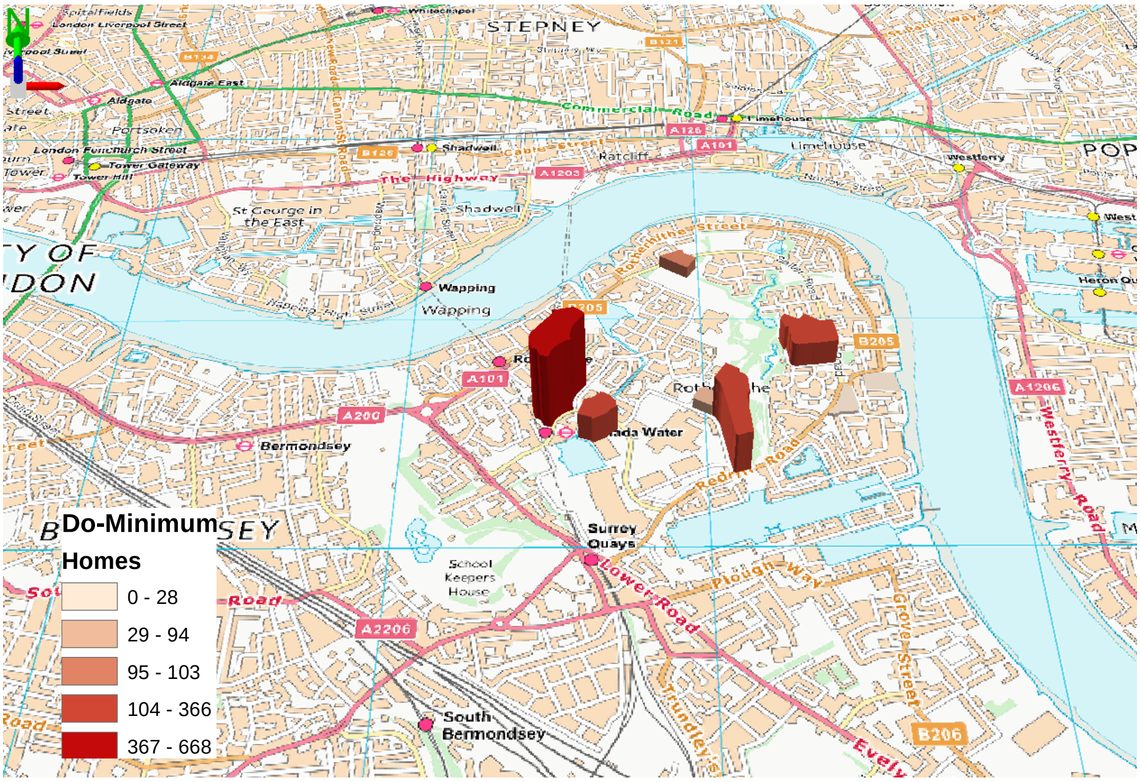
6.3 Canada Water development

6.3.1 Do-minimum

As explained in **Section 1**, the do-minimum scenario consists of all consented development in the Canada Water area. The location and number of homes expected to be built by 2031 for each site included in the do-minimum scenario can be seen in **Figure 23**. The net change in homes, population, jobs etc. brought about by the development assumptions for each site displayed has been added to 2011 levels and run through the LTS demand model to generate expected highway demand for the 2031 do-minimum scenario.

All assumptions input to the LTS demand model are displayed in **Figure 11**.

Figure 23: Do-Minimum development - Homes



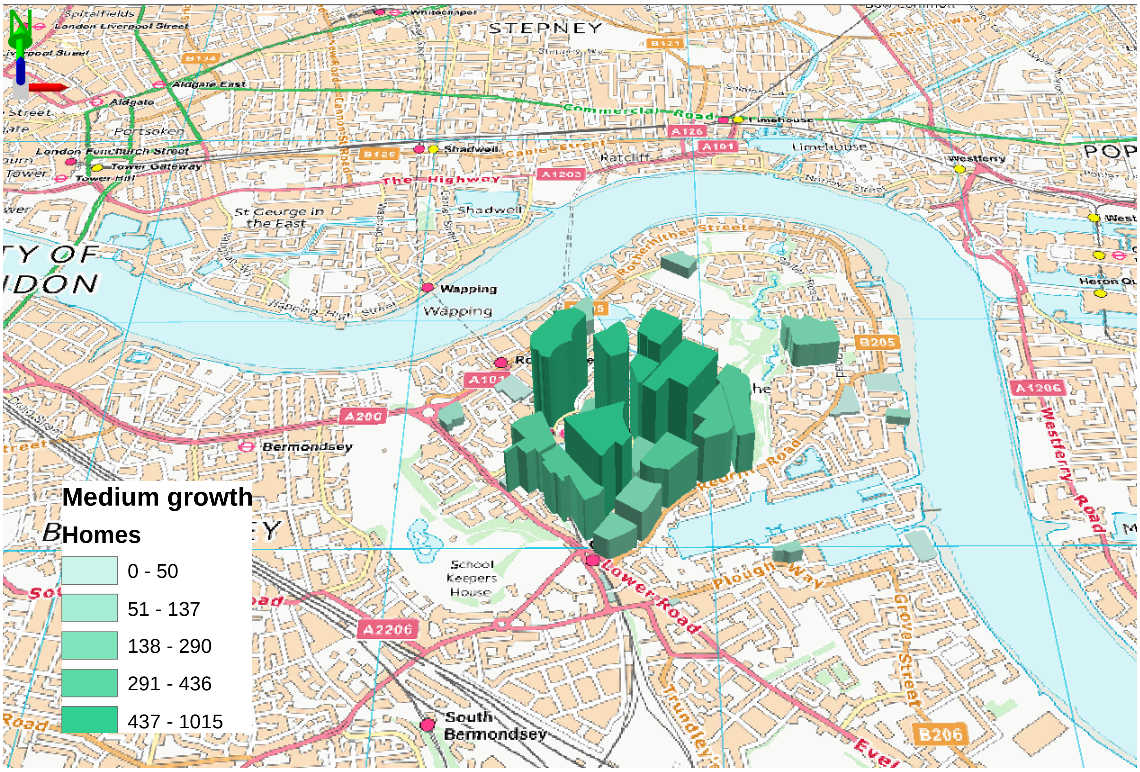
Source: Ordnance Survey data © Crown copyright and database right 2016

The net change in car ownership and jobs, based on the development assumptions shown in **Figure 11** has been allocated to the highway zoning structure and then added to the 2011 values in order to calculate appropriate split factors to re-proportion demand across the whole of Canada Water.

6.3.2 Medium Growth

The medium growth scenario uses the do-minimum scenario, as described in **Section 6.3.1**, as a starting point and adds further net changes to homes, population and jobs etc. based on both consented and non-consented development sites. The number and location of homes expected in the medium growth scenario can be seen in **Figure 24**.

Figure 24: Medium growth development - Homes



Source: Ordnance Survey data © Crown copyright and database right 2016

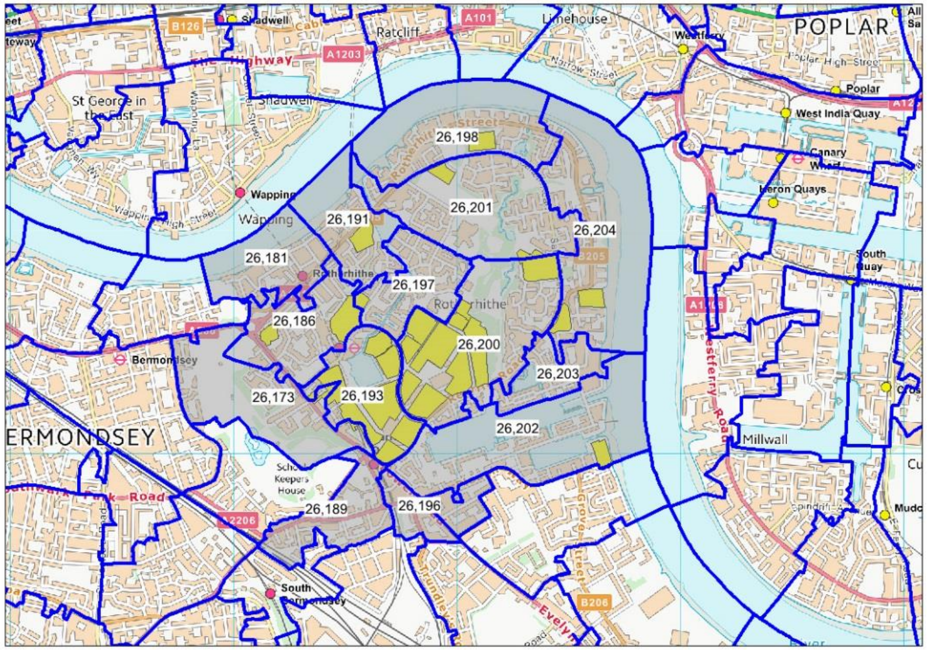
The net change in car ownership and jobs, based on the development assumptions shown in **Figure 12** has been allocated to the highway zoning structure and then added to the 2011 values in order to calculate appropriate split factors to re-proportion demand across the whole of Canada Water.

6.4 Matrix disaggregation

The zones identified in **Figure 25** from the CLoHAM P3 model, as received from TfL, have been disaggregated into the zones seen in **Figure 26** before being assigned on to the highway network (N.B. zoning structure in **Figure 26** is the same as **Figure 7**). In order to do this accurately, the highlighted zones in **Figure 25** all need to be combined into a temporary single zone before the trip ends are then re-proportioned across the peninsula in accordance with the zoning structure in **Figure 26**.

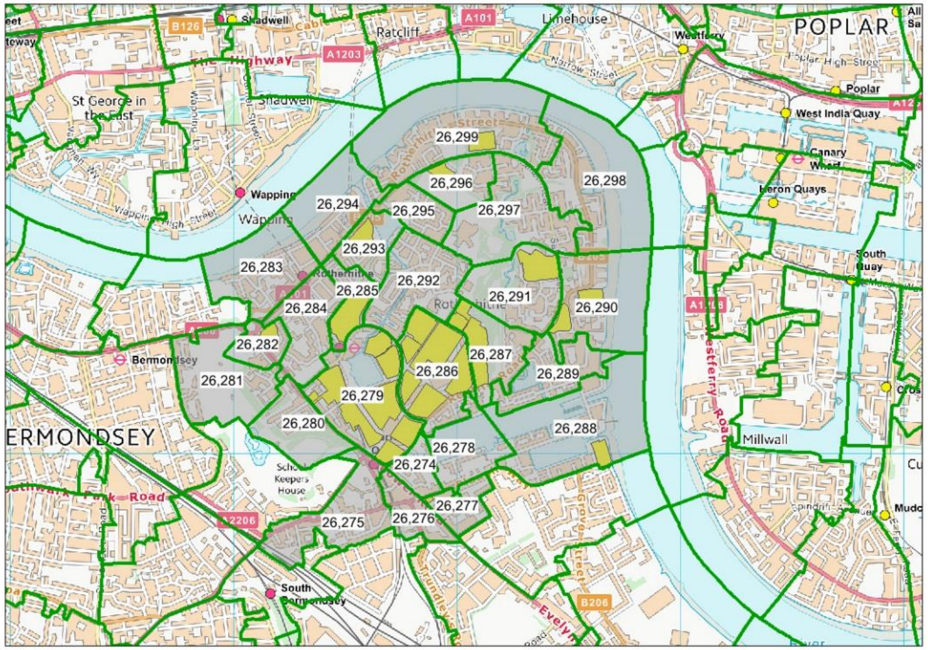
The factors used to re-proportion the trip ends, as stated above, have used car ownership levels to distribute trips with a destination in the peninsula and the number of jobs in each zone for trips with an origin in the peninsula. This is because the development is largely office based employment and residential; the large majority of trips will therefore be commuter trips meaning more trips leaving the area in the PM. The full trip end distribution factors for the entire peninsula can be seen in **Table 17**.

Figure 25: Zones to combine



Source: Ordnance Survey data © Crown copyright and database right 2016

Figure 26: Disaggregated zones



Source: Ordnance Survey data © Crown copyright and database right 2016

Table 17: Trip end distribution

	No. cars		Jobs		% Destinations		% Origins	
New zone	DM	Med	DM	Med	DM	Med	DM	Med
26274	62	62	91	91	0.8%	0.7%	1.2%	0.3%
26275	380	380	447	447	5.2%	4.4%	5.7%	1.3%
26276	190	190	210	210	2.6%	2.2%	2.7%	0.6%
26277	178	178	189	189	2.4%	2.1%	2.4%	0.5%
26278	143	143	165	165	2.0%	1.7%	2.1%	0.5%
26279	725	1,393	1,655	15,833	9.9%	16.2%	20.9%	45.9%
26280	122	122	96	96	1.7%	1.4%	1.2%	0.3%
26281	493	493	287	287	6.7%	5.7%	3.6%	0.8%
26282	6	6	180	180	0.1%	0.1%	2.3%	0.5%
26283	187	187	254	254	2.6%	2.2%	3.2%	0.7%
26284	352	352	344	344	4.8%	4.1%	4.3%	1.0%
26285	509	509	132	132	7.0%	5.9%	1.7%	0.4%
26286	210	843	629	13,063	2.9%	9.8%	8.0%	37.8%
26287	114	116	180	180	1.6%	1.4%	2.3%	0.5%
26288	545	545	275	275	7.5%	6.3%	3.5%	0.8%
26289	324	324	319	319	4.4%	3.8%	4.0%	0.9%
26290	393	393	215	215	5.4%	4.6%	2.7%	0.6%
26291	173	173	188	188	2.4%	2.0%	2.4%	0.5%
26292	504	504	343	343	6.9%	5.9%	4.3%	1.0%
26293	195	195	83	83	2.7%	2.3%	1.0%	0.2%
26294	0	0	140	140	0.0%	0.0%	1.8%	0.4%
26295	166	166	352	352	2.3%	1.9%	4.4%	1.0%
26296	149	149	30	30	2.0%	1.7%	0.4%	0.1%
26297	292	292	161	161	4.0%	3.4%	2.0%	0.5%
26298	403	403	571	571	5.5%	4.7%	7.2%	1.7%
26299	494	494	375	375	6.8%	5.7%	4.7%	1.1%
TOTAL	7,309	8,612	7,911	34,523	100%	100%	100%	100%

Source: CW split proportions_all scenarios.xlsx

6.5 Matrix checks

Following the running of the LTS demand model, in depth checks of the matrices are required to assess whether the changes in trip generation, trip distribution and modal share are as expected before the assignment stage. The 'topline statistics' for the LTS run are checked first and were seen to be sensible and therefore matrix conversion and trip end re-proportioning using the factors in **Table 17** was undertaken to transform demand from LTS into highway PM peak hour demand, further checks could then be undertaken, these checks are documented below.

6.5.1 Matrix totals by user class

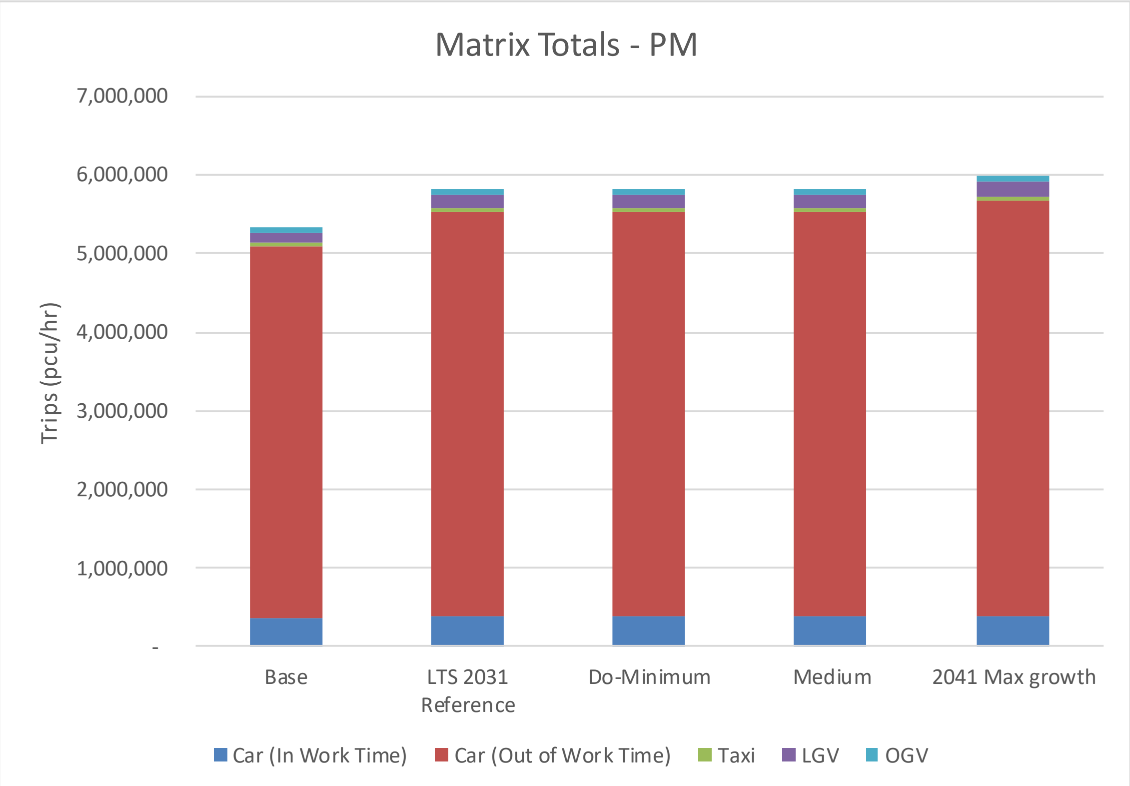
Matrix totals, following the running of LTS and the 'CHAMP' conversion process to HAM matrix format, are given in **Table 18** and displayed in **Figure 27**. At a total CLoHAM level, the medium growth scenario shows a very minor reduction in trips (-76 pcu/hr) when compared to the do-minimum scenario, whilst this decrease possibly seems counter-intuitive, the number of trips in the local Canada Water area should be examined to determine whether the LTS demand adjustments are in line with expected outcomes with respect to each scenario. It is possible that this minor decrease between the do-minimum and medium growth scenarios is due to changes in external trips which don't pass through the study area.

Table 18: Matrix totals - PM

User Class	2012 Base year	LTS 2031 Reference	2031 Do-Minimum	2031 Medium	2041 Max growth
Car (In Work Time)	354,452	374,323	374,312	374,366	382,451
Car (Out of Work Time)	4,740,869	5,160,344	5,160,143	5,159,994	5,297,261
Taxi	38,588	41,096	41,096	41,096	41,096
LGV	124,500	167,172	167,183	167,189	187,866
OGV	72,526	73,849	73,848	73,861	74,486
Total	5,330,935	5,816,784	5,816,582	5,816,506	5,983,160

Source: C3_2679Z_A1X1CWXX_R073_PM.UFM

Figure 27: Matrix Totals - PM



Source: CW_HAM_Sectored comparison_PM_v3.xlsx

6.5.2 Trip generation

As mentioned above, in order to ascertain whether the changes to land use in the Canada Water area have had an expected impact on trip generation, trip numbers in the Canada Water area have been examined. The number of trip destinations (trips arriving in the area) and trip origins (trips leaving the area) are displayed in **Table 19**. The total trip numbers across the entire peninsula display significant increases between the do-minimum and medium growth scenarios in the PM peak (38% increase in trip destinations and 46% increase in trip origins).

The development in the Canada Water area in the medium growth scenario is planned to be largely employment based, this is reflected in the trip generation figures below as there is both a larger increase and higher absolute number of trips leaving the area in the PM peak.

As described in **Section 6.4**, further re-proportioning of trip ends was undertaken to allocate the correct number of trips to the correct locations based on development locations. The % splits of origins and destinations in **Table 19** match those given in **Table 17** which indicates that the trip end re-proportioning methodology was successful. The same development assumptions are used for the 2041 'maximum' growth scenario as the 2031 medium growth scenario and thus the same disaggregation factors were used.

Table 19: Canada Water trip ends – PM Total (pcu/hr)

	Destinations			Origins			% Destinations			% Origins		
New zone	DM	Med	Max	DM	Med	Max	DM	Med	Max	DM	Med	Max
26274	12	14	14	19	6	6	0.8%	0.7%	0.7%	1.2%	0.3%	0.3%
26275	73	86	84	92	31	30	5.2%	4.4%	4.4%	5.7%	1.3%	1.3%
26276	36	43	42	43	14	14	2.6%	2.2%	2.2%	2.7%	0.6%	0.6%
26277	34	40	40	39	13	13	2.4%	2.1%	2.1%	2.4%	0.5%	0.5%
26278	27	32	32	34	11	11	2.0%	1.7%	1.7%	2.1%	0.5%	0.5%
26279	138	313	309	339	1,087	1,070	9.9%	16.2%	16.2%	20.9%	45.9%	45.9%
26280	23	27	27	20	7	7	1.7%	1.4%	1.4%	1.2%	0.3%	0.3%
26281	94	111	109	59	20	19	6.7%	5.7%	5.7%	3.6%	0.8%	0.8%
26282	1	1	1	37	12	12	0.1%	0.1%	0.1%	2.3%	0.5%	0.5%
26283	36	42	42	52	17	17	2.6%	2.2%	2.2%	3.2%	0.7%	0.7%
26284	67	79	78	70	24	23	4.8%	4.1%	4.1%	4.3%	1.0%	1.0%
26285	97	114	113	27	9	9	7.0%	5.9%	5.9%	1.7%	0.4%	0.4%
26286	40	190	187	129	897	883	2.9%	9.8%	9.8%	8.0%	37.8%	37.8%
26287	22	26	26	37	12	12	1.6%	1.4%	1.4%	2.3%	0.5%	0.5%
26288	104	123	121	56	19	19	7.5%	6.3%	6.3%	3.5%	0.8%	0.8%
26289	62	73	72	65	22	22	4.4%	3.8%	3.8%	4.0%	0.9%	0.9%
26290	75	88	87	44	15	15	5.4%	4.6%	4.6%	2.7%	0.6%	0.6%
26291	33	39	38	38	13	13	2.4%	2.0%	2.0%	2.4%	0.5%	0.5%
26292	96	113	112	70	24	23	6.9%	5.9%	5.9%	4.3%	1.0%	1.0%
26293	37	44	43	17	6	6	2.7%	2.3%	2.3%	1.0%	0.2%	0.2%
26294	0	0	0	29	10	9	0.0%	0.0%	0.0%	1.8%	0.4%	0.4%
26295	32	37	37	72	24	24	2.3%	1.9%	1.9%	4.4%	1.0%	1.0%
26296	28	33	33	6	2	2	2.0%	1.7%	1.7%	0.4%	0.1%	0.1%
26297	56	66	65	33	11	11	4.0%	3.4%	3.4%	2.0%	0.5%	0.5%
26298	77	91	89	117	39	39	5.5%	4.7%	4.7%	7.2%	1.7%	1.7%
26299	94	111	110	77	26	25	6.8%	5.7%	5.7%	4.7%	1.1%	1.1%
TOTAL	1,396	1,937	1,912	1,620	2,371	2,334	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Source: CW Trip Ends.xlsx

Table 20 and **Table 21** display the total Canada Water trip ends given in **Table 19**, broken down by user class. This also gives expected results as most of the development planned in the Canada Water area is office based employment and residential, most of the changes in trip generation between the do-minimum and the medium growth scenarios should therefore occur in the 'Car - In Work Time' and 'Car – out of work time' user classes.

Table 20: Canada Water trip destinations – by user class (pcu/hr)

User Class	DM	Medium	Max
Car IWT	180	228	231
Car OWT	912	1158	1132
Taxi	9	9	9
LGV	211	416	423
OGV	84	126	118
Total	1,396	1,937	1,912

Source: CW_HAM_Sectored comparison_PM_v3.xlsx

Table 21: Canada Water trip origins – by user class (pcu/hr)

User Class	DM	Medium	Max
Car IWT	137	246	258
Car OWT	1132	1459	1405
Taxi	64	64	64
LGV	228	500	513
OGV	59	101	95
Total	1,620	2,371	2,334

Source: CW_HAM_Sectored comparison_PM_v3.xlsx

6.5.3 Trip distribution

Figure 28 to **Figure 33** and **Table 22** to **Table 24** display the locations and quantity of trips coming from the Canada Water area (origins) and going to the Canada Water area (destinations) for the 2031 do-minimum, 2031 medium growth and 2041 maximum growth scenarios. Full sectored trip matrices can be seen in **Appendix** A.

6.5.3.1 Do-minimum

Table 22, **Figure 28** and **Figure 29** show a high concentration of short distance trips to and from the development area in Southwark and Lewisham along with a 'thin' spread of trips leaving the development and arriving in Greenwich and the Isle of Dogs.

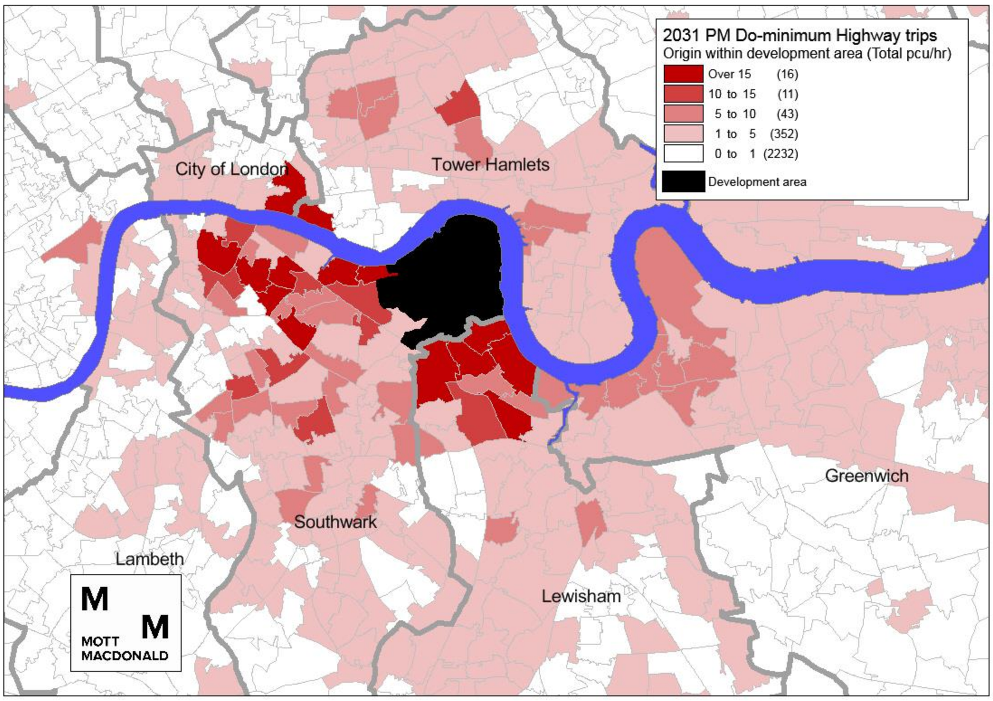
Table 22: Do-minimum peninsula trip distribution – PM peak (pcu/hr)

Do-minimum	From	% From	To	% To
Rest of the world	122	8%	60	4%
Development area	187	12%	187	13%
Lambeth	47	3%	74	5%
Southwark	482	30%	555	40%
Lewisham	207	13%	193	14%
Greenwich	145	9%	61	4%
Wandsworth	5	0%	8	1%
Hammersmith and Fulham	5	0%	1	0%
Kensington and Chelsea	2	0%	1	0%
City of Westminster	12	1%	4	0%

Do-minimum	From	% From	To	% To
Camden	6	0%	4	0%
Tower Hamlets	175	11%	128	9%
Islington	6	0%	5	0%
Hackney	14	1%	6	0%
Newham	27	2%	11	1%
City of London	27	2%	48	3%
West	6	0%	7	0%
North	19	1%	6	0%
East	99	6%	18	1%
South	27	2%	17	1%
Total	1620	100%	1396	100%

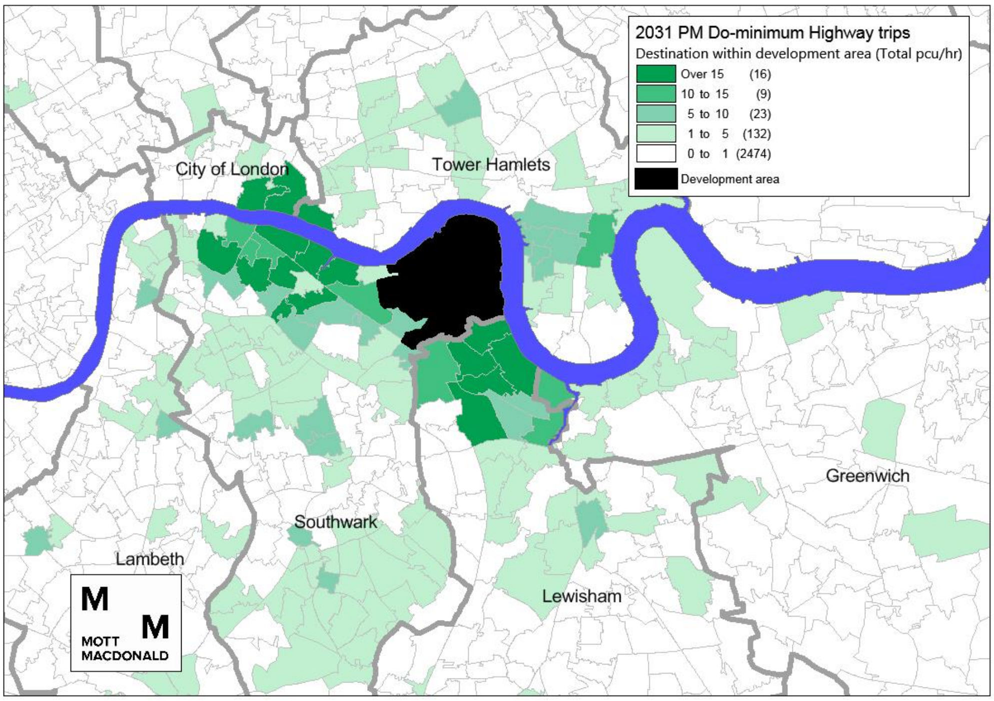
Source: CW_HAM_Sectored comparison_PM_v3_18Sectors.xlsx

Figure 28: 2031 Do-minimum development area trip origins



Source: A131CW06_PM Masterplan trips.xlsx

Figure 29: 2031 Do-minimum development area trip destinations



Source: A131CW06_PM Masterplan trips.xlsx

6.5.3.2 Medium growth

Table 23, **Figure 30** and **Figure 31** show that as medium growth development is introduced to the Canada Water area, the concentration of trips to and from the local areas in Southwark and Lewisham intensify and the amount of trips from the development across to Greenwich also increases. Also, as the development introduced to Canada Water in the medium growth scenario is mostly employment based, there is a larger increase in trips leaving the development area in the PM peak than in trips arriving when comparing to the do-minimum scenario.

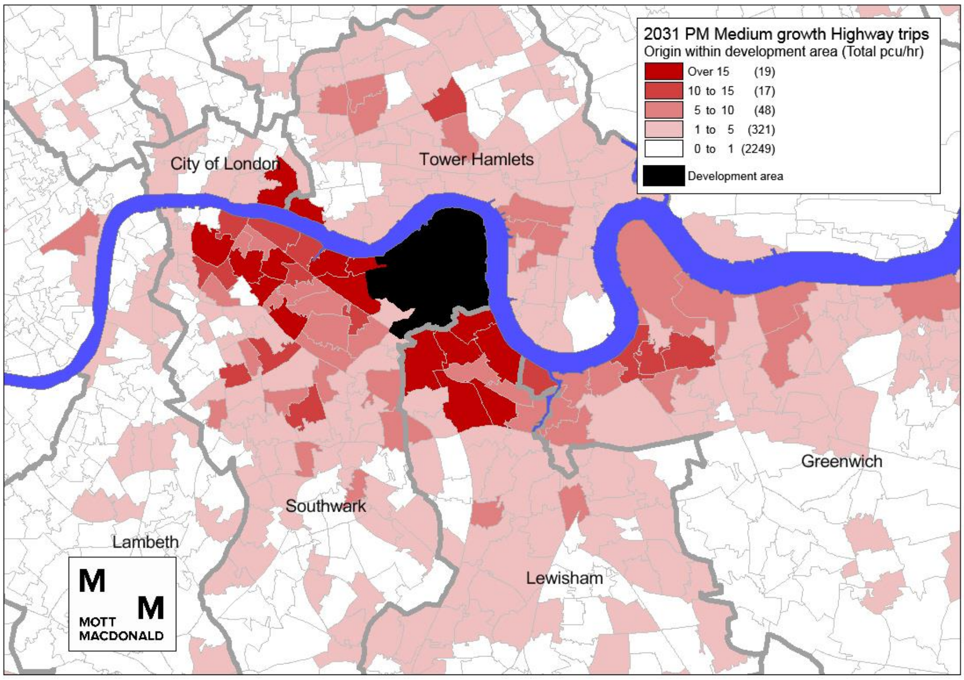
Table 23: Medium growth peninsula trip distribution – PM peak (pcu/hr)

Medium growth	From	% From	To	% To
Rest of the world	230	10%	96	5%
Development area	319	13%	319	16%
Lambeth	59	2%	84	4%
Southwark	594	25%	656	34%
Lewisham	280	12%	233	12%
Greenwich	228	10%	93	5%
Wandsworth	25	1%	27	1%
Hammersmith and Fulham	10	0%	5	0%
Kensington and Chelsea	10	0%	8	0%
City of Westminster	19	1%	14	1%
Camden	23	1%	24	1%
Tower Hamlets	218	9%	178	9%
Islington	15	1%	12	1%

Medium growth	From	% From	To	% To
Hackney	21	1%	11	1%
Newham	41	2%	29	2%
City of London	41	2%	68	4%
West	11	0%	10	0%
North	38	2%	13	1%
East	123	5%	25	1%
South	66	3%	32	2%
Total	2371	100%	1937	100%

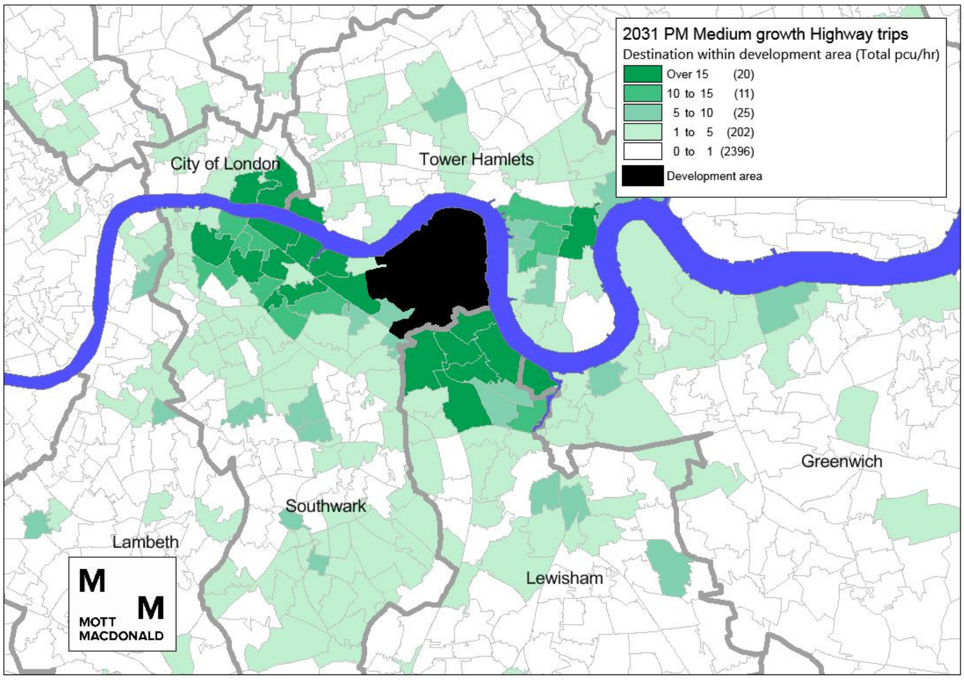
Source: CW_HAM_Sectored comparison_PM_v3_18Sectors.xlsx

Figure 30: 2031 Medium growth development area trip origins



Source: A131CW07_PM Masterplan trips.xlsx

Figure 31: 2031 Medium growth development area trip destinations



Source: A131CW07_PM Masterplan trips.xlsx

6.5.3.3 2041 Maximum growth

Table 24, **Figure 32** and **Figure 33** as expected display very similar patterns of trips coming from and going to the peninsula as the medium growth scenario; this is because the same development assumptions have been used for the 2041 maximum growth scenario as the 2031 medium growth, with most differences in demand being external to the development area.

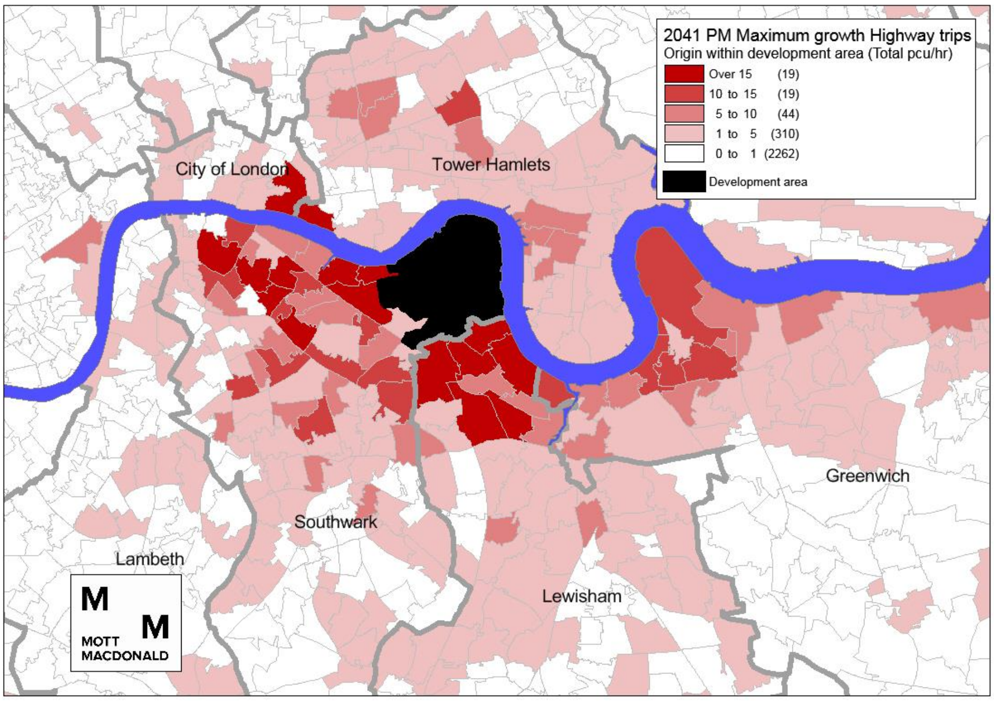
Table 24: 2041 Maximum growth peninsula trip distribution – PM peak (pcu/hr)

2041 Maximum growth	From	% From	To	% To
Rest of the world	223	10%	104	5%
Development area	293	13%	293	15%
Lambeth	62	3%	88	5%
Southwark	617	26%	662	35%
Lewisham	265	11%	220	12%
Greenwich	229	10%	96	5%
Wandsworth	24	1%	26	1%
Hammersmith and Fulham	16	1%	11	1%
Kensington and Chelsea	8	0%	7	0%
City of Westminster	19	1%	13	1%
Camden	21	1%	22	1%
Tower Hamlets	211	9%	177	9%
Islington	14	1%	11	1%
Hackney	21	1%	10	1%
Newham	41	2%	31	2%
City of London	38	2%	64	3%

2041 Maximum growth	From	% From	To	% To
West	11	0%	10	1%
North	35	2%	13	1%
East	122	5%	25	1%
South	63	3%	30	2%
Total	2334	100%	1912	100%

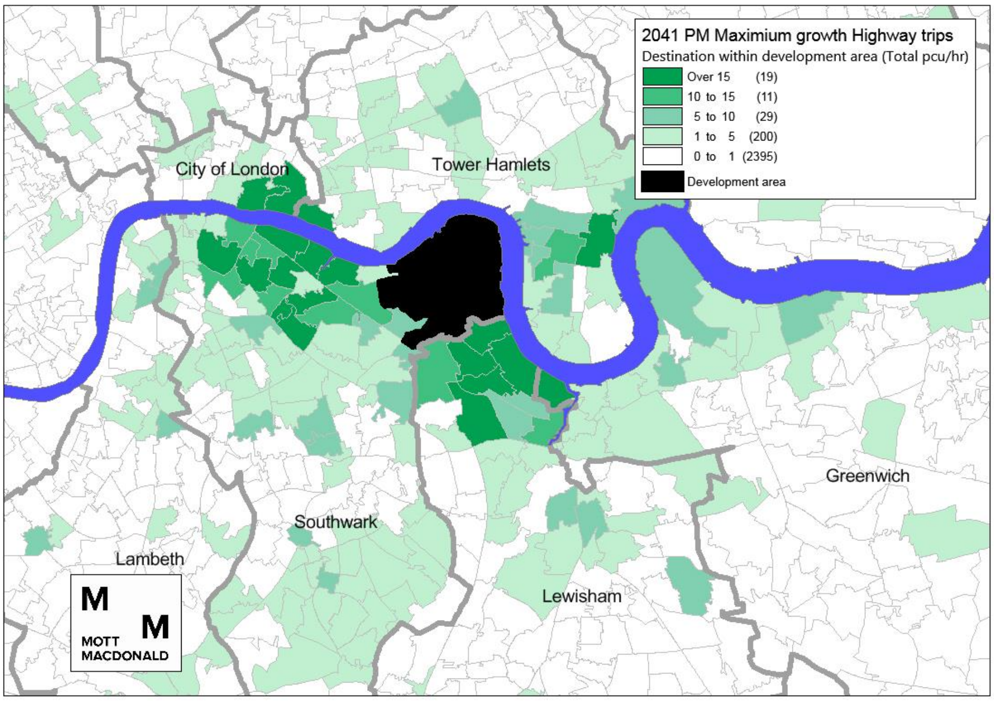
Source: CW_HAM_Sectored comparison_PM_v3_18Sectors.xlsx

Figure 32: 2041 Maximum growth development area trip origins



Source: A141CW09_PM Masterplan trips.xlsx

Figure 33: 2041 Maximum growth development area trip destinations



Source: A141CW09_PM Masterplan trips.xlsx

7 Public Transport development scenario results

7.1 Summary of Analysis

Forecast year scenarios have been compared to one another across key metrics to understand how network challenges change over time and with the introduction of different transport interventions and land use changes. The time horizons reported here cover:

- 2011 Base year
- 2021 without Elizabeth Line
- 2021 with Elizabeth Line
- 2031 Do Minimum
- 2031 Medium Development

We have included 2021 scenarios with and with the Elizabeth Line as it is important to understand the impact on Canada Water of this major scheme, which is expected to notably reduce patronage and crowding on several Underground lines including the Jubilee Line. It should be noted that these scenarios have not been developed alongside our Canada Water 2011 Base, 2031 Do Minimum and 2031 Medium Development models, they have been supplied by TfL for this analysis only.

The analysis in this section will focus on three primary metrics:

- 3hr AM peak period public transport passenger flows
- 3hr AM peak period station movements at Canada Water
- 1hr AM peak hour crowding (standing passengers per square metre (pax/sqm))

These metrics have been used to define four major public transport challenges at Canada Water, upon which the additional OA development has a varying impact:

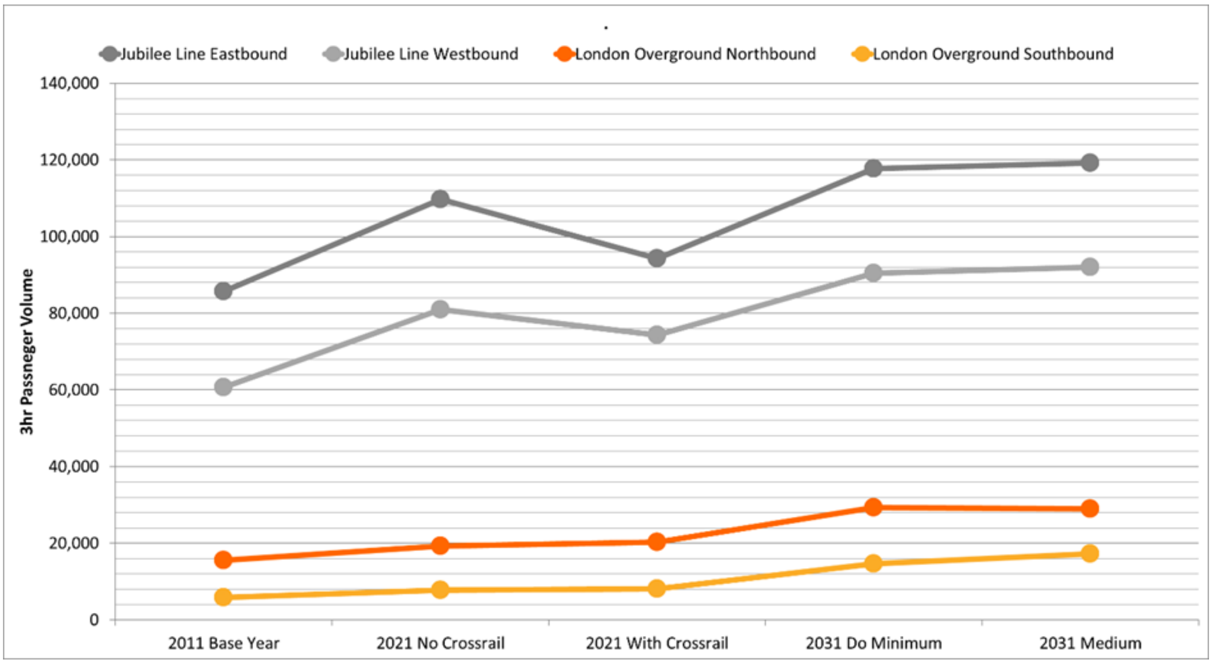
- **Line loads on the Jubilee Line and London Overground**
- **Crowded conditions on these lines**
- **Interchange between London Overground and Jubilee Line at Canada Water**
- **Low bus mode share for trips to/from the area**

7.2 Analysis of Key Metrics

7.2.1 Passenger Flows

Figure 34 shows the total 3h AM peak period passenger volume into and out of Canada Water station on the Jubilee Line and London Overground. The chart shows how this indicator of line usage changes over time and with the introduction of the Elizabeth Line in 2021 and the Canada Water OA in 2031. Further detail on directional flows is found in the Crowding section.

Figure 34: Change in Passenger Volumes Into and Out of Canada Water Station



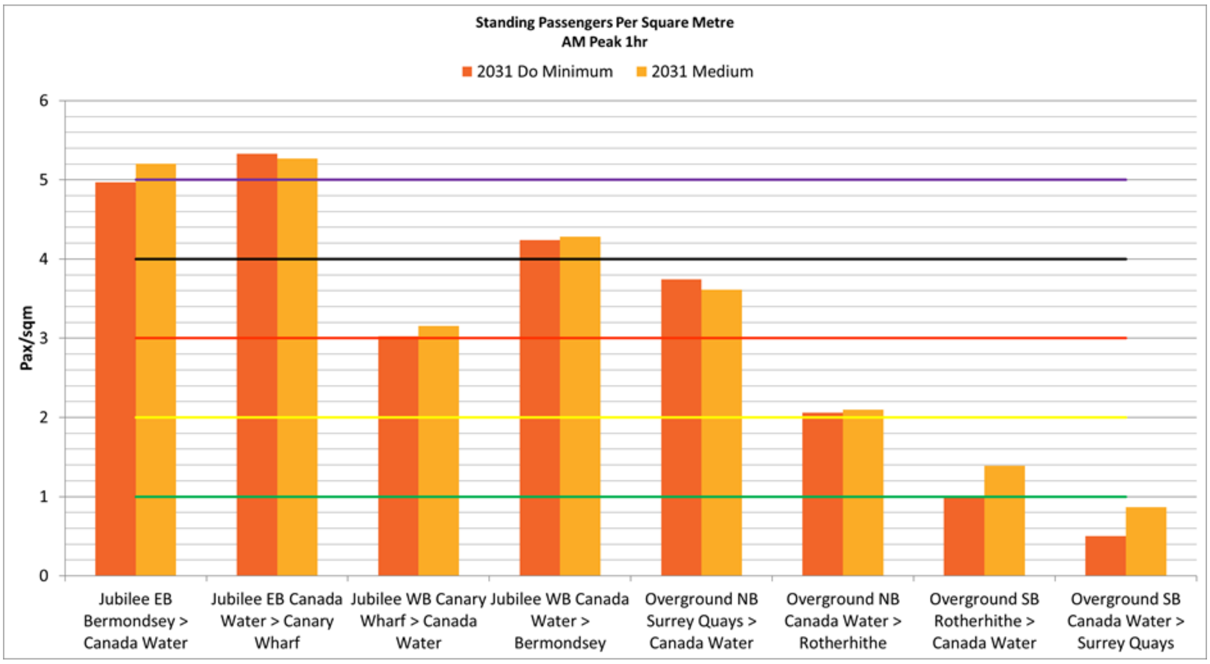
Key observations include:

- Substantial growth (approximately 25-30%) in Jubilee and East London Line is forecast in the 10 year period between 2011 Base and 2021 no Elizabeth Line.
- The impact of the Elizabeth Line on the Jubilee Line is highly beneficial. Additional east-west routes that serve the Isle of Dogs creates and alternative option to the Jubilee Line and alleviates flows through Canada Water by approximately 14% eastbound and 8% westbound. Substantial alleviation is also seen on the Central Line and DLR; impacts on the East London Line are more negligible, with a small increase in northbound and southbound flows.
- Substantial growth is also observed in the 10 year period between 2021 (with Elizabeth Line) and the Canada Water 2031 scenario; approximately 22-25% on Jubilee Line and between 45% (northbound) and 81% (southbound) on the East London Line.
- The impact of the Medium Development over the Do Minimum results in a relatively low key net change in flows. Jubilee Line flows increase by a nominal 1-2%, as do East London Line northbound flows. Southbound East London Line shows a more significant increase of 18%, but these flows are still only around half that of the northbound direction.
- However, it should be noted that there are impacts on the wider network. The increase in houses and jobs in the Canada Water OA increases the amount of trips to and from the locale, and these trips utilise capacity on the lines through the area. As such, passengers who would normally travel through Canada Water are displaced and forced to use alternative routes; use of DLR, Central Line and Elizabeth Line all increase as a result.
- It is noted that 2021 and 2031 forecasts of London Overground volumes are lower than figures observed in recent years. There is some doubt as to the level to which East London Line demand might subside, and when, as factors that are considered to have caused a spike in demand in recent years are resolved (for example, Southern rail reliability issues and disruption through London Bridge due to the station remodelling).

7.2.2 Crowding

Figure 35 shows the AM peak 1hr number of passengers standing per square metre on services through Canada Water between the 2031 Do Minimum and Medium Development scenarios. Whereas **Figure 34** has aggregated the links either side of Canada Water (e.g. Bermondsey to Canada Water has been combined with Canada Water to Canary Wharf), this data is presented individually to help illustrate the impact of the change in trips to and from the OA.

Figure 35: Standing Passengers Per Square Metre on Canada Water Services



Key observations include:

- Crowding in the Jubilee Line is alleviated with the introduction of the Elizabeth Line, however, the next 10 years of background growth between 2021 and 2031 results in crowding levels that are similar to the highly stressed 2011 base conditions.
- Overall the impact of the Medium development is relatively low; Jubilee Line crowding changes by +/-0.2 standing passengers and East London Line by +0.4. These changes are small compared to the absolute level of standing passengers, and in most instances do not change the crowding banding the link falls into.
- Eastbound Jubilee Line suffers the worst crowding of the public transport links in the Canada Water area, and is one of the worst across London. The issues is worst between Canada Water and Canary Wharf, where conditions on approach to Canada Water are compounded by East London Line to Jubilee Line interchange for access to Canary Wharf.
- As noted in the assessment of passenger flows, the increase of trips to and from the Canada Water OA itself pushes other uses previously travelling through Canada Water onto other services. This is shown in the increase in crowding between Bermondsey and Canada Water (trips to the OA) but then a decrease in crowding after Canada Water as the number of through passengers are fewer.
- Crowding levels on westbound Jubilee Line, and more notably southbound East London Line, increase in line with the increase in trips to and from the OA due to the increase in homes and

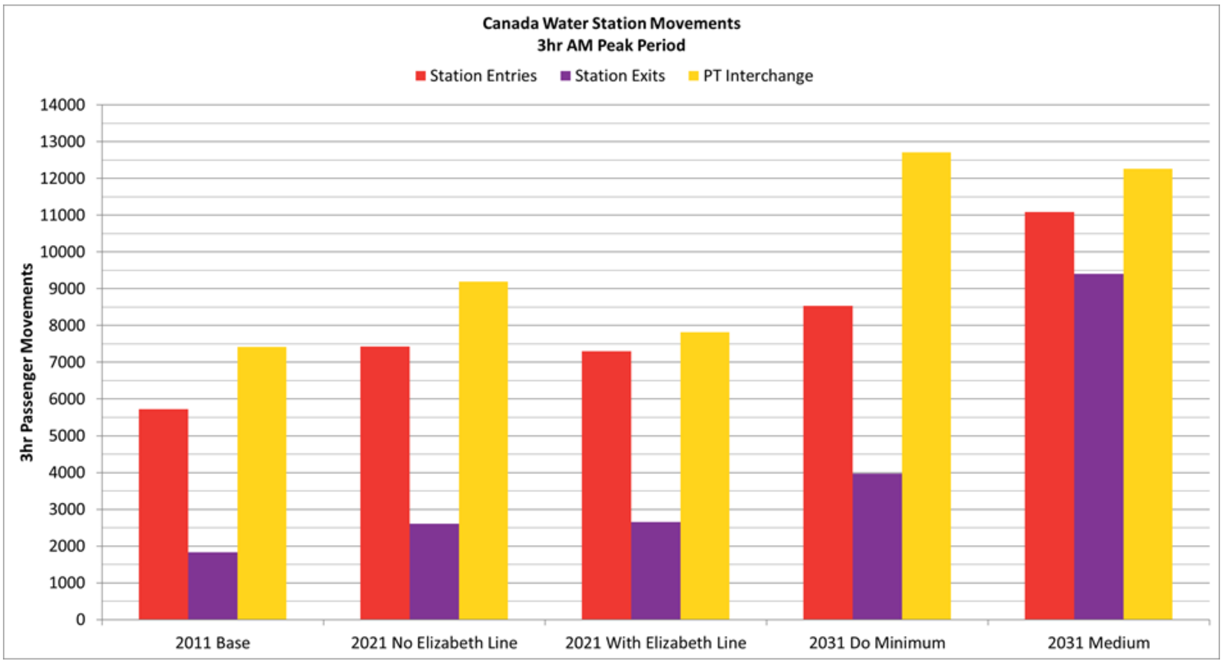
jobs. Southbound East London Line experiences the highest change in crowded conditions but is the least stressed route through the OA so the impacts are not severe.

7.2.3 Canada Water Interchange

Recent observations have shown Canada Water is a key interchange hub between the East London Line (predominantly northbound) and Jubilee Line (both eastbound and westbound) with these movements being amongst the highest interchange on the London Overground network. Our modelling also reflects the importance of this movement and assessment of the impact of development on it is of key importance to the STS. In addition to reporting Railplan analysis, data from the model has been passed to Mott MacDonald's pedestrian modelling team for detailed assessment using Legion.

Figure 36 and **Figure 37** show the change in passenger movements at Canada Water and Surrey Quays stations respectively. The comparison between scenarios shows 3hr AM peak period station entries, exits and total interchange.

Figure 36: Passenger Movements at Canada Water Station

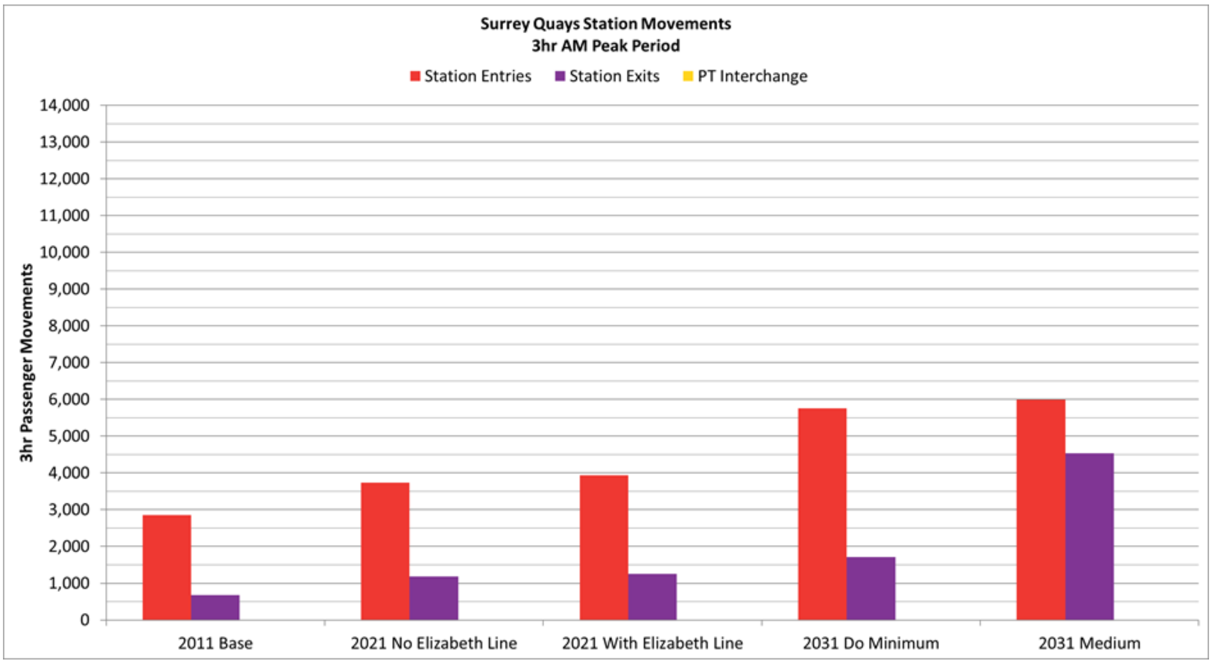


Key observations at Canada Water station include:

- The introduction of the Elizabeth line brings notable alleviation (-15%) to interchange movements at Canada Water as a result of the new interchange opportunity at Whitechapel for East London Line users heading to the Isle of Dogs.
- The 10 years of background growth between the 2021 with Elizabeth Line and 2031 Do Minimum scenario results in significant rises in station entries, exits and most significantly interchange; 17%, 49% and 63% increases respectively.
- The impact of the Medium Development on interchange movements is actually a minor reduction, which may be due to the new job opportunities in the OA affecting the destination distribution of trips from along the East London Line, reducing interchange numbers.

- Station entries (30%) and exits (137%) increase significantly over the Do Minimum and are in line with the proportional increase in homes (trip origins in the AM peak, therefore station entries) and jobs (trip destinations in the AM peak, therefore station exits).

Figure 37: Passenger Movements at Surrey Quays Station



Key observations at Canada Water station include:

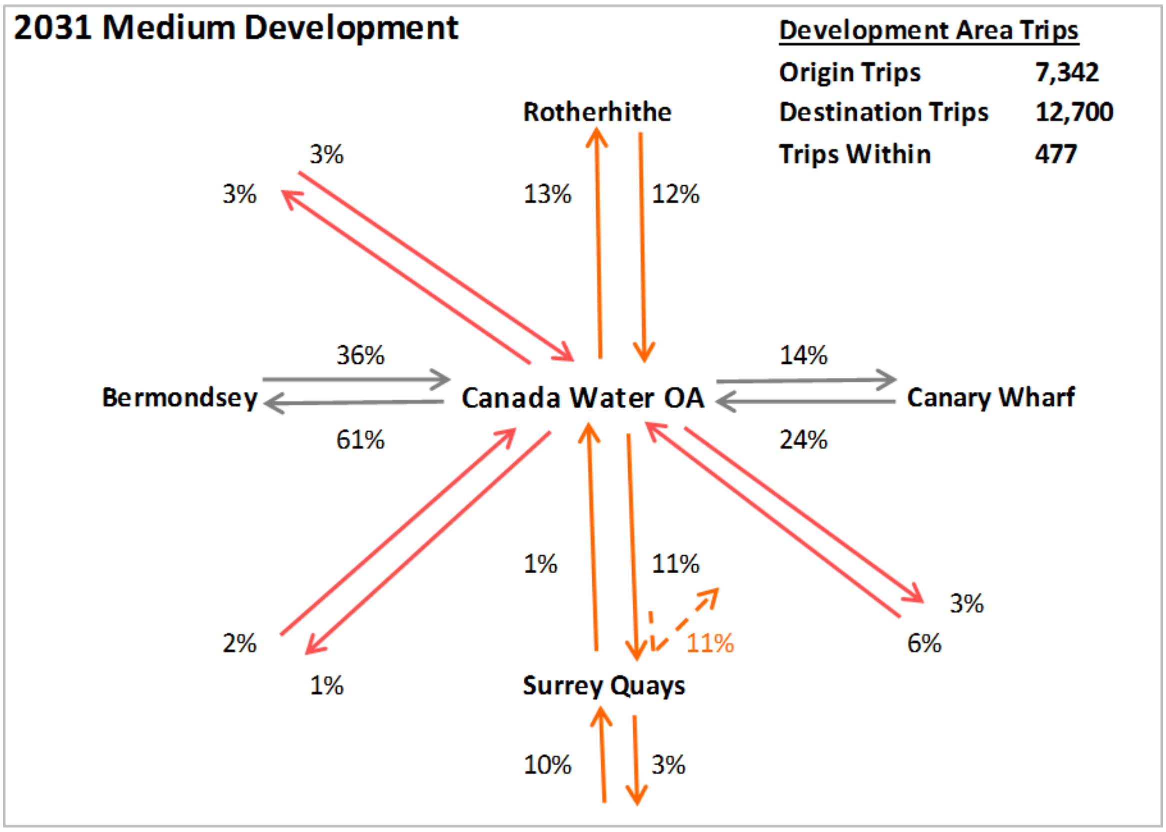
- From the 2011 Base model the first significant rise in station activity at Surrey Quays comes between 2021 and 2031, and predominantly affects station entries.
- Entries are only marginally affected by the Medium Development, however, but with a significant rise in station exits indicating this station's proximity the development area and a reflection upon the large number of additional jobs the Medium scenario brings.
- Note that at Surrey Quays there is no interchange as all London Overground lines use the same platforms.

Observed data has shown a continual rise over the last few years, attributed to reaction to ongoing disruption through London Bridge due to the major station update and Southern trains reliability issues. It is acknowledged that our modelled scenarios do not reflect current day trends and that 2031 forecasts for East London Line to Jubilee Line interchange are lower than the most recent 2017 data TfL have gathered. Demand response to improved future conditions and reversion to previous travel patterns through London Bridge is assumed in the modelling, and the likelihood of this is being monitored by TfL through analysis of the latest usage data.

7.2.4 Mode Share

Figure 38 displays the public transport sub-mode share for trips to and from the development area. Sub-mode share represents the competition between the routes and services modelling in Railplan, specifically London Overground, Jubilee Line and buses for the Canada Water OA.

Figure 38: PT Sub-mode share to/from Canada Water OA



Key observations include:

- Jubilee Line is the dominant public transport choice for trips to and from the OA, accounting for at least 60% of trips in each direction. Furthermore, the majority of this demand is either travelling to or from the west (i.e. Central London and Central London termini).
- East London Line and bus mode share is broadly similar at around 10% of trips.
- For trips to the OA, Surrey Quays serves the majority of East London Line trips. From the south the 9% of all trips alight here, with a further 1% alighting at Canada Water. Similarly from the north 1% alight at Canada Water and a further 11% alight at Surrey Quays.
- A smaller number of trips leave the OA area by London Overground, the majority of which are travelling north and use Canada Water station.
- Bus mode share is relatively low, particularly when considering at a corridor level. Trips to/from the area to the south west, towards Old Kent Road, make up a small proportion of the overall number. Those to/from the west, towards London Bridge and Waterloo, are competing with Jubilee Line and as such the low share is not unexpected. The largest bus shares are seen on the corridor to/from the south east, where the rail options do not provide the same level of direct competition.

7.2.5 Wider Impacts

As well as the localised impacts highlighted in the analysis above, the Medium Development scenario would be expected to have some impact on the wider public transport network. These impacts are all relatively minor as trips dissipate across various access and egress routes and there are no significantly large absolute or proportion changes outside of the local area. The redistribution of trip origins/destinations of those travelling to/from the OA is spread out across the GLA and beyond so not concentrated impact is noticed. There is some minor route switching for trips to Canary Wharf as those to the new jobs at Canada Water push existing users to opt for alternative routes such as DLR or Elizabeth Line, but these impacts are only in the region of a 2% increase on these other lines.

8 Highway development scenario results

As described in **Section 1**, this study focuses on three core development scenarios. Appropriate networks (**Section 3**) and matrices (**Section 6**) have been produced and assigned for each development scenario. Comparisons have then been drawn between the scenarios to determine the relevant impacts of development traffic. This section will display results whereby the network remains in a consistent state and demand varies according to the development present in each scenario.

This section will display the comparisons made between the scenarios, focussing on the key metrics below, with the aim of identifying any locations on the network which appear to be under stress as a result from the additional demand generated by the development.

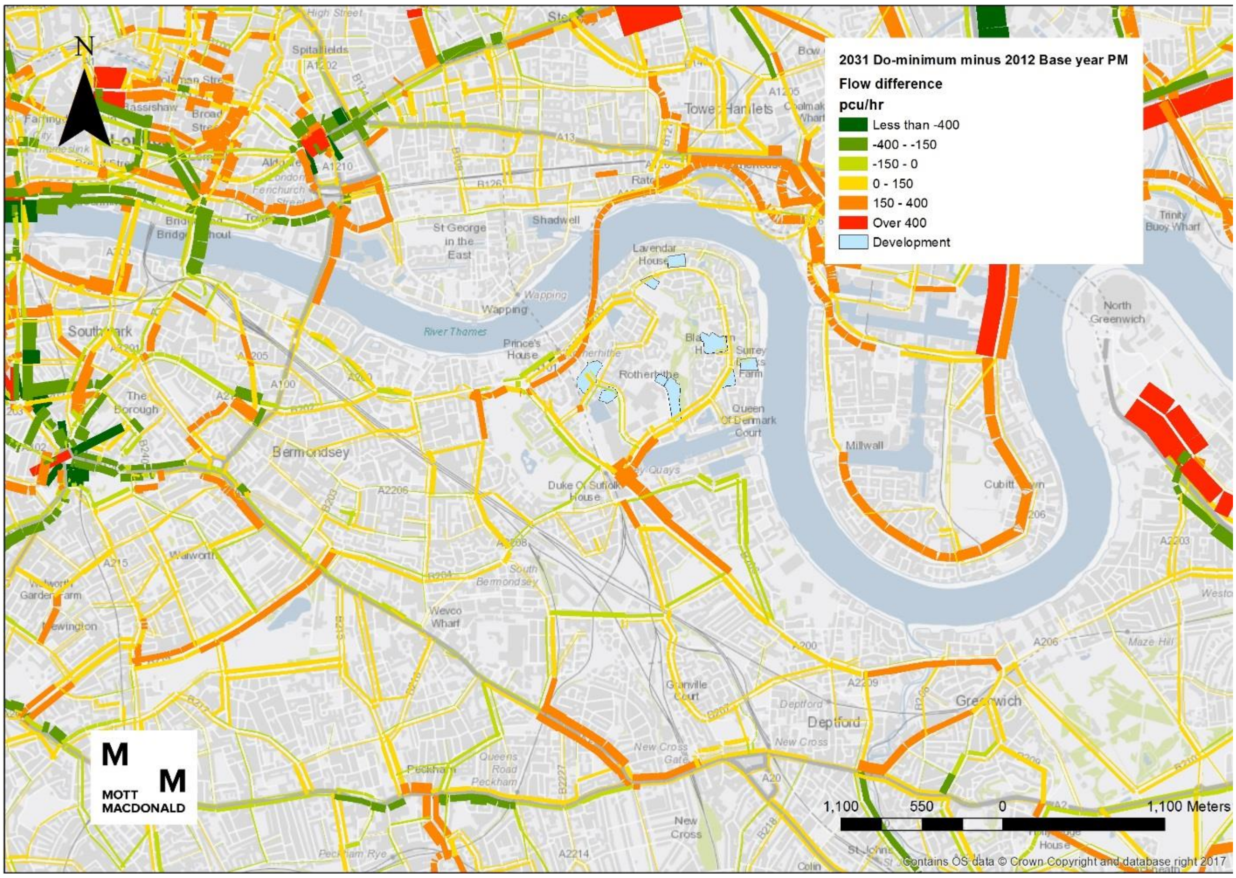
- Changes in flow to all traffic;
- Changes in flow to Rotherhithe Tunnel traffic only;
- Changes in Rotherhithe Tunnel traffic proportions on Jamaica Road and Lower Road;
- Changes in average junction delay;
- Absolute 'worst-turn' volume over capacity;
- Journey times along key corridors and bus routes.

8.1 Flow differences

The 'total flow' plots below display the difference in total actual flow (pcu/hr) between the two named scenarios on every link in the network in the PM peak hour. The 'tunnel traffic only' plots below display the difference in actual flow (pcu/hr) between the two named scenarios, only showing traffic that uses the Rotherhithe Tunnel in the PM peak hour; this is done using 2-way select link analysis in both scenarios with the difference between the two being displayed.

8.1.1 2031 Do-minimum compared with 2012 Base year – Total flow

Figure 39: 2031 Do-minimum compared with 2012 Base year – Total flow (pcu/hr)



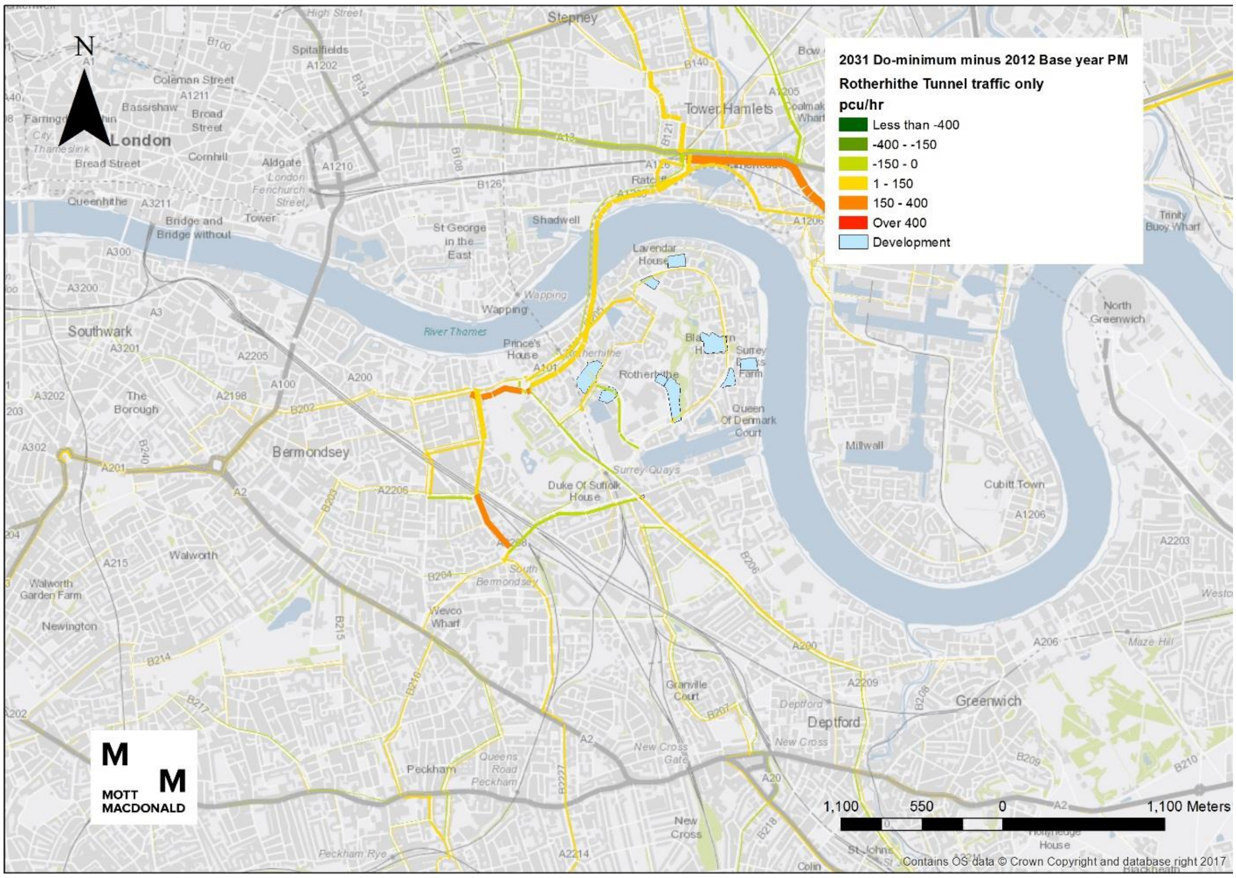
Source: Ordnance Survey data © Crown copyright and database right 2016

The number of trip ends (origins and destinations) leaving and arriving in the peninsula in the PM peak is similar in the 2031 do-minimum scenario when compared to the 2012 base year. This therefore means that any changes in traffic flow around Canada Water come from background 'through' traffic or are capacity related changes.

Figure 39 displays minor increases in flow in the Rotherhithe Tunnel heading southbound and increases on Lower Road southbound, Jamaica Road westbound and Southwark Park Road southbound. These increases in flow are likely to be generated from background growth as the only changes to capacity in Canada Water are the introduction of the 20mph limit on all roads in Southwark.

8.1.2 2031 Do-minimum compared with 2012 Base year – Tunnel traffic only

Figure 40: 2031 Do-minimum compared with 2012 Base year – Tunnel traffic only (pcu/hr)

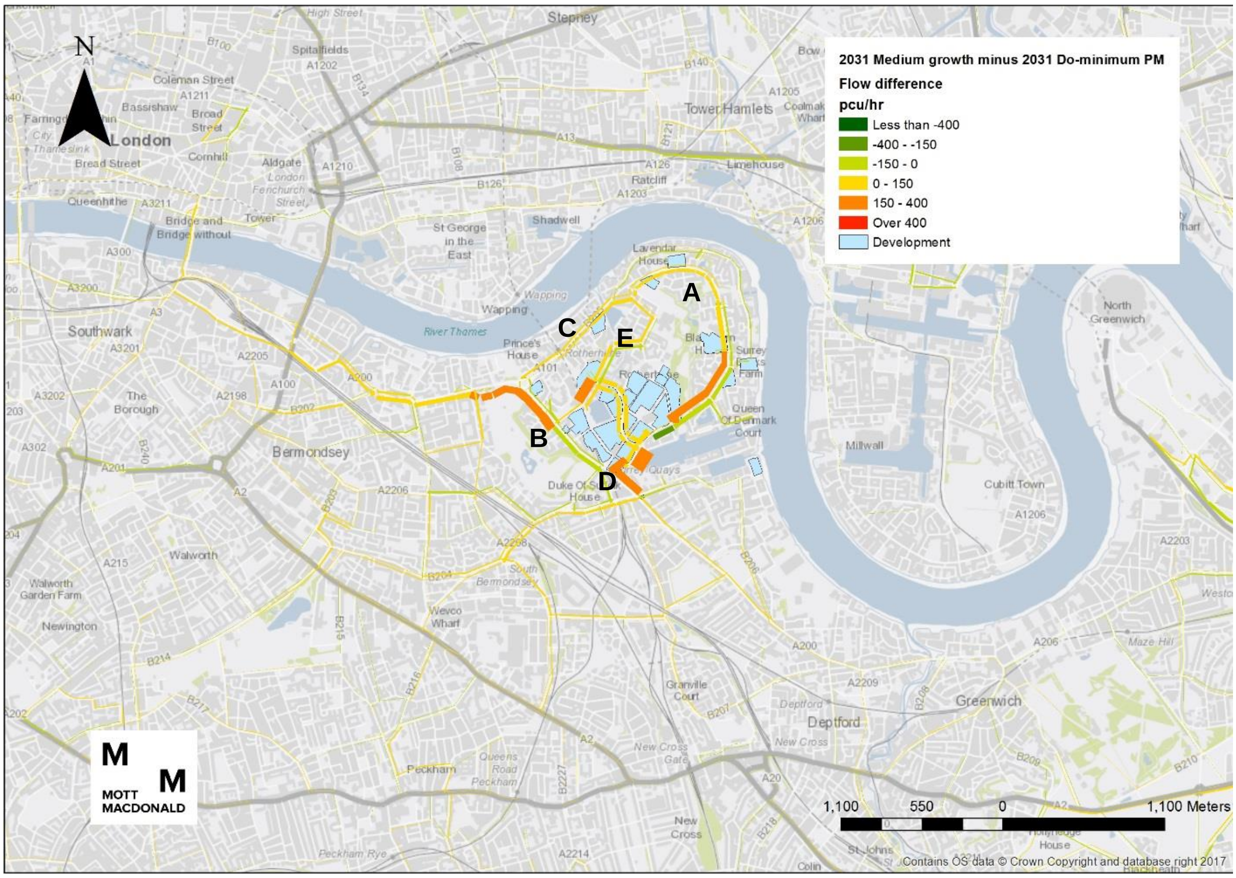


Source: Ordnance Survey data © Crown copyright and database right 2016

Figure 40 reveals that a large majority of traffic that causes the increase in flow in the Rotherhithe Tunnel southbound continues on to Southwark Park Road in order to access Old Kent Road and further south.

8.1.3 2031 Medium growth compared with 2031 Do-minimum – Total flow

Figure 41: 2031 Medium growth compared with 2031 Do-minimum – Total flow (pcu/hr)



Source: Ordnance Survey data © Crown copyright and database right 2016

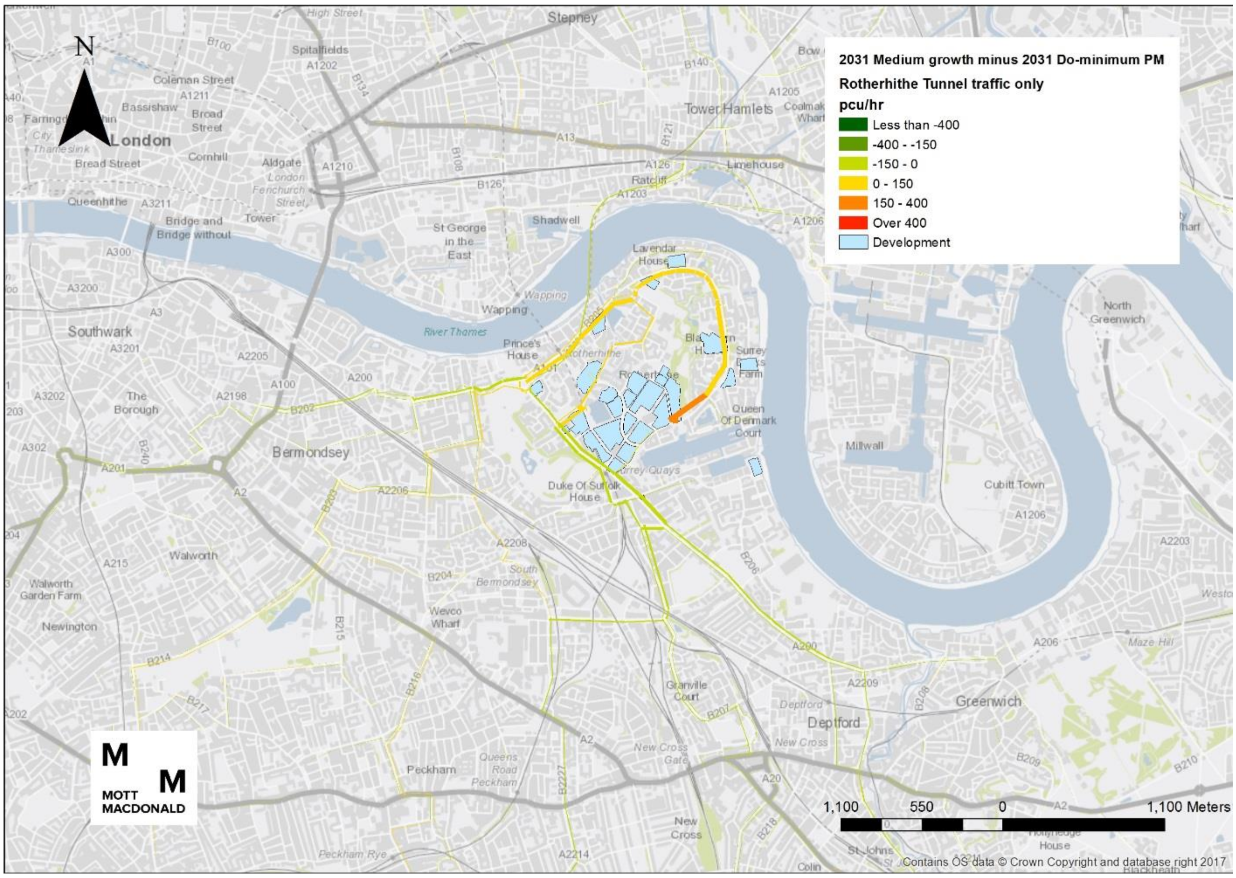
Figure 41 displays how the introduction of traffic generated from all consented and non-consented development (which form the medium growth scenario), impact the local strategic highway network. Some key points to note when comparing the medium growth scenario to the do-minimum are as follows:

- Some traffic from the development area uses Salter Rd (**A**) to access the tunnel as access to Lower Road (**B**) is operating nearly at capacity following the introduction of development traffic in the area. Salter Road and Brunel Road (**C**) is therefore an attractive option because the Surrey Quays Road/Lower Road junction (**B**) is at capacity and the Redriff Road/Lower Road junction (**D**) feeds into the gyratory which is also operating at capacity and is a circuitous route to the roundabout.
- However, some of the traffic on Salter Road accesses zones to the north of the peninsula. Traffic accessing Lower Road from the zones to the north of the peninsula also follow Salter Road round to Brunel Road rather than using Redriff Road to avoid the majority of the development traffic which is loaded on to Redriff Road; this is made apparent by the reduction in traffic heading southbound from Salter Road on to Redriff Road in **Figure 41.**
- Traffic appears to also be using the minor road, Needleman Street (**E**), to access Brunel Road and the tunnel as the Surrey Quays Road/Lower Road is operating at capacity.

- There is a decrease on Lower Rd before the junction with Surrey Quays Rd indicating that previous ‘through traffic’ is displaced from Lower Rd and sent further west (possibly via Rotherhithe New Rd) as the Tunnel is at capacity in the do-min and remains at capacity in the medium growth scenario (as shown by the zero change in the tunnel), this is further emphasised by minor increases on Tower Bridge (as seen in the plot) and also on London Bridge and further west.

8.1.4 2031 Medium growth compared with 2031 Do-minimum – Tunnel traffic only

Figure 42: 2031 Medium growth compared with 2031 Do-minimum – Tunnel traffic only (pcu/hr)



Source: Ordnance Survey data © Crown copyright and database right 2016

Figure 42 shows the difference in flow between the medium growth and do-minimum scenarios for Rotherhithe Tunnel traffic only. The reduction of traffic on Lower Road in both directions indicates there is a reduction in ‘through traffic’ accessing the tunnel. It is possible that, as the tunnel operates at full capacity in both the do-minimum and medium growth scenarios, development traffic is taking the place of ‘through traffic’ in the tunnel resulting in the displacement of traffic from Lower Road to find alternative routes to cross the river.

As displayed in **Figure 41**, there are minor increases in flow heading northbound on Tower Bridge, London Bridge, Blackfriars Bridge and also as far as Waterloo Bridge. There is also a small portion of traffic attempting to re-route to use the Blackwall Tunnel, however, as the tunnel is already operating at capacity, the re-routed traffic is heavily delayed south of the river and is not able to cross the river within the time period. The change in river crossing flows between the do-minimum and medium growth scenario can be seen in **Table 25**.

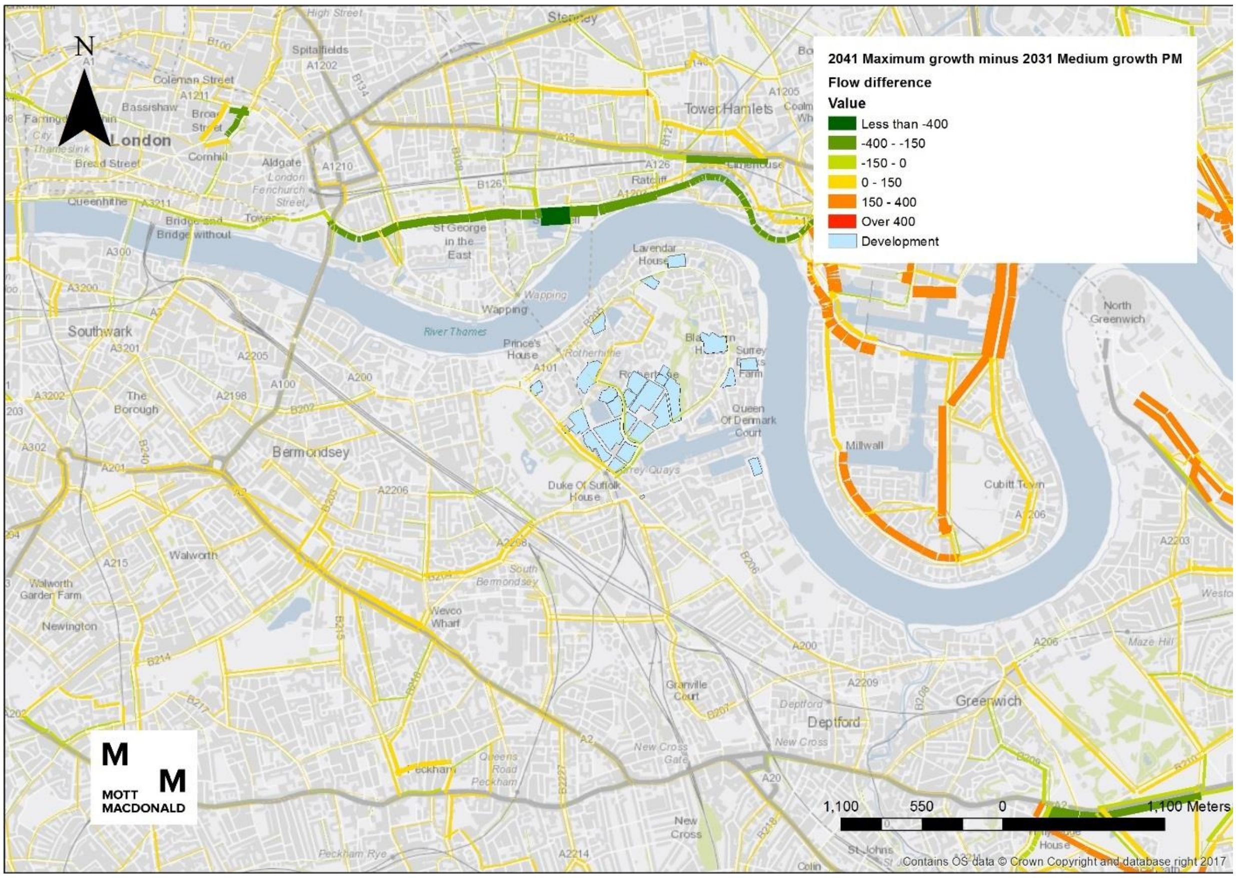
Table 25: River Crossing flows

	Total actual flow (pcu/hr)					
	Northbound			Southbound		
	DM	Medium	Difference	DM	Medium	Difference
Blackwall Tunnel	3240	3240	0	3703	3703	0
Rotherhithe Tunnel	1000	1000	0	1086	1085	0
Tower Bridge	1060	1073	13	1350	1350	0
London Bridge	880	905	25	591	590	-1
Southwark Bridge	370	370	0	436	432	-3
Blackfriars Bridge	835	844	8	1245	1247	2
Waterloo Bridge	1491	1493	2	1652	1647	-6

Source: River crossing flows.xlsx

8.1.5 2041 Maximum growth compared with 2031 Medium growth – Total flow

Figure 43: 2041 Maximum growth compared with 2031 Medium growth – Total flow (pcu/hr)



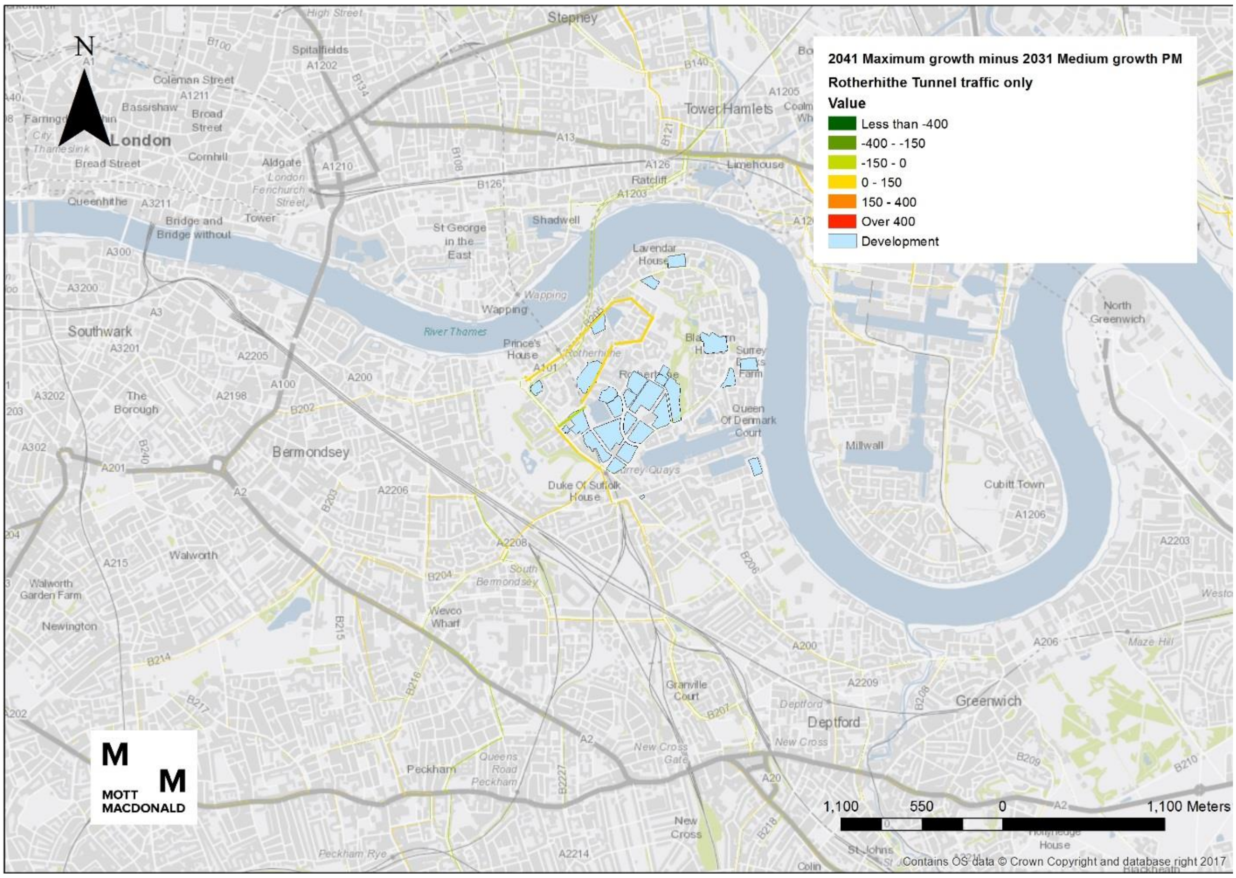
Source: Ordnance Survey data © Crown copyright and database right 2016

The 2041 ‘maximum’ growth scenario uses the same development assumptions in Canada Water as the 2031 medium growth scenario. **Figure 43** shows the difference in flow between the 2041 ‘maximum’ growth scenario and the 2031 medium growth scenario; this therefore displays the impact that background growth between 2031 and 2041 has on the change in flows in the Canada Water area.

The figure above shows large increases in flow on the Isle of Dogs and decreases in the Limehouse Link Tunnel and further west, both of these are north of the river, with no significant changes in flow in the Canada Water area.

8.1.6 2041 Max growth compared with 2031 Medium growth – Tunnel traffic only

Figure 44: 2041 Maximum growth compared with 2031 Medium growth – Tunnel traffic only (pcu/hr)

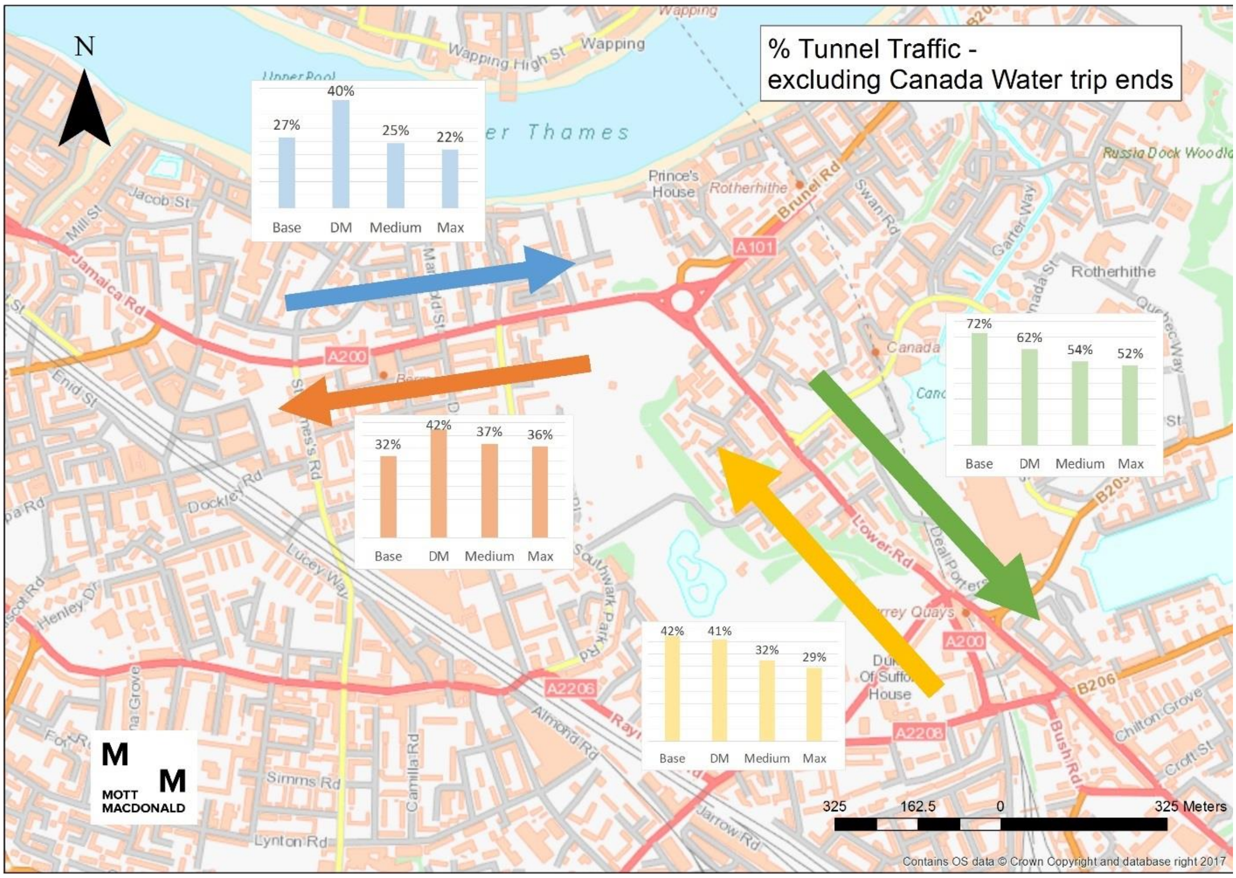


Source: Ordnance Survey data © Crown copyright and database right 2016

As described above, the development assumptions are the same between the 2041 maximum growth scenario and the 2031 medium growth scenario, because of this, there are minimal differences in tunnel traffic between the two scenarios.

8.1.7 Proportion of traffic on Lower Road and Jamaica Road using the tunnel

Figure 45: Proportion of traffic on Lower Road and Jamaica Road using the tunnel

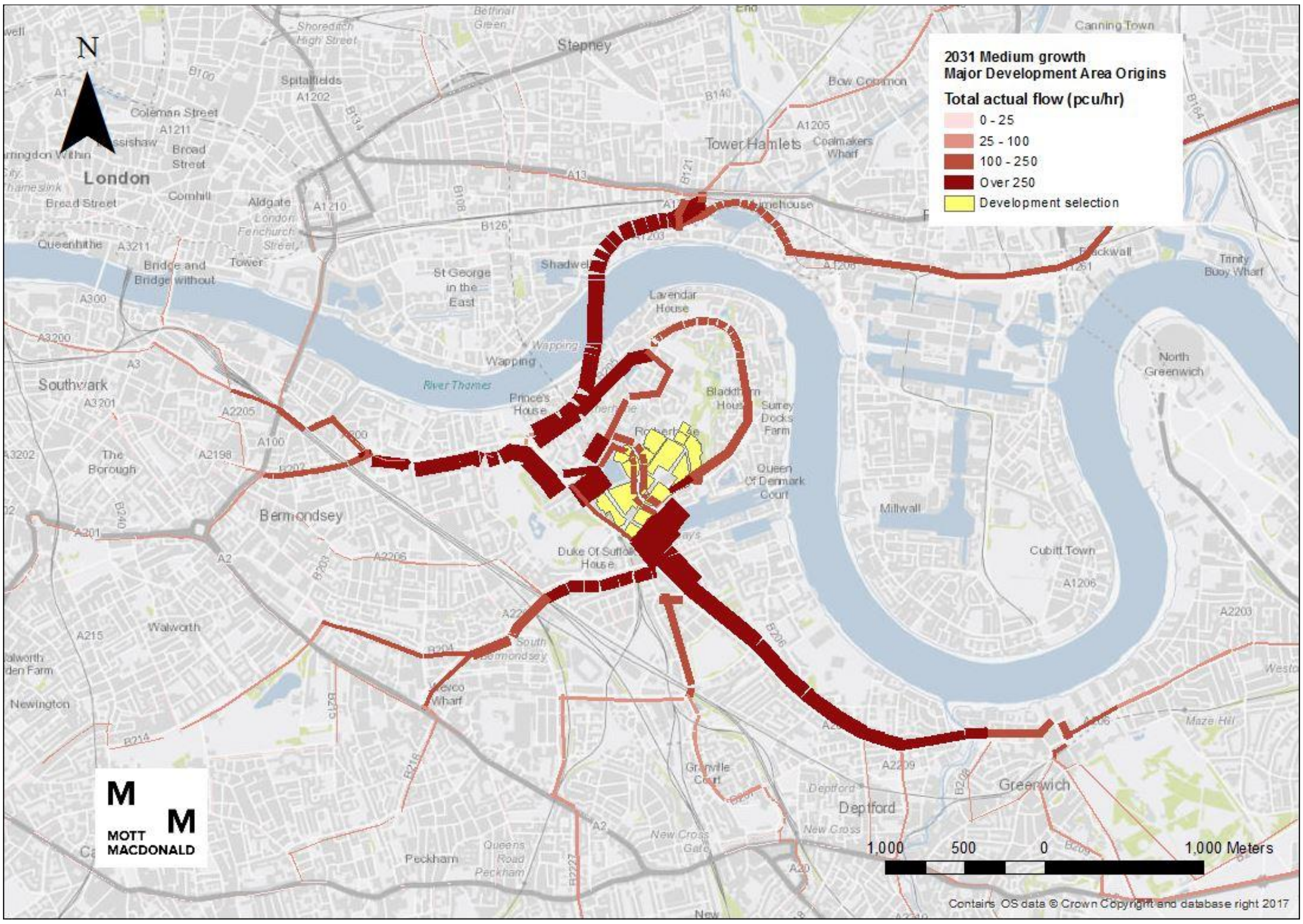


Source: Ordnance Survey data © Crown copyright and database right 2016

Figure 45 displays the proportion of ‘through’ traffic accessing the tunnel; all trips which have an origin or destination in the Canada Water peninsula have been excluded so the figure above displays the proportion of traffic passing through the area. The plot also aligns with comments made in **Section 8.1.4** and shows that when development is present in Canada Water, the amount of through traffic accessing the tunnel reduces as tunnel capacity is used up by development traffic.

8.1.8 Development only traffic

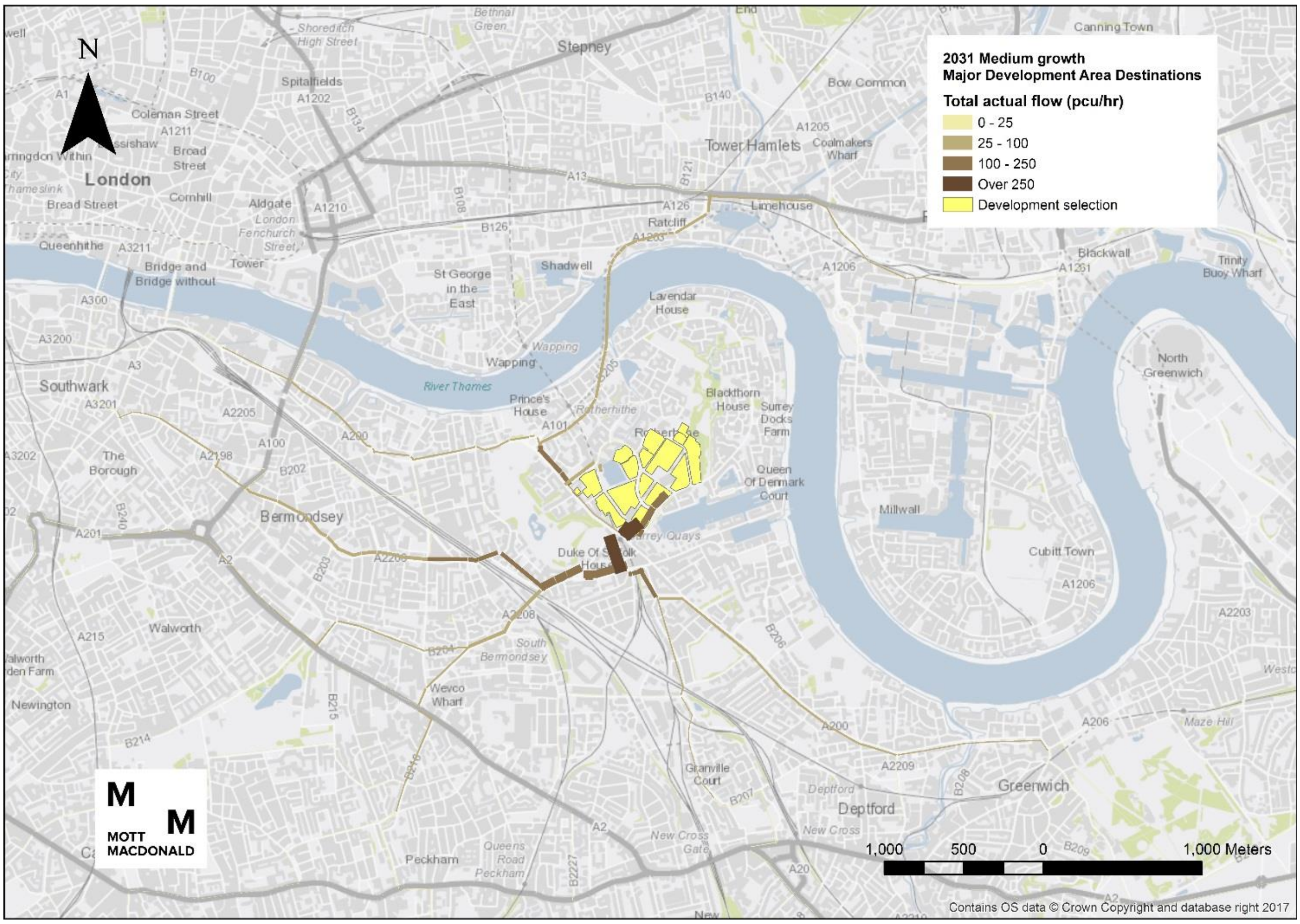
Figure 46: 2031 Medium growth – Major Development Area trip origins (pcu/hr)



Source: Ordnance Survey data © Crown copyright and database right 2016

Figure 46 shows the routes chosen and quantity of traffic leaving zones 26279 and 26286 and **Figure 47** shows where traffic is arriving from in the PM peak. The plots show a reasonably even split of traffic between the Rotherhithe Tunnel, Jamaica Road and Lower Road. **Figure 46** shows that a very small proportion of 'tunnel using' traffic from the development accesses the tunnel via Lower Road and around the roundabout (approx. 20%). The other 80% of 'tunnel using' development traffic access the tunnel via Needleman Street and Salter Road.

Figure 47: 2031 Medium growth – Major Development Area trip destinations (pcu/hr)



Source: Ordnance Survey data © Crown copyright and database right 2016

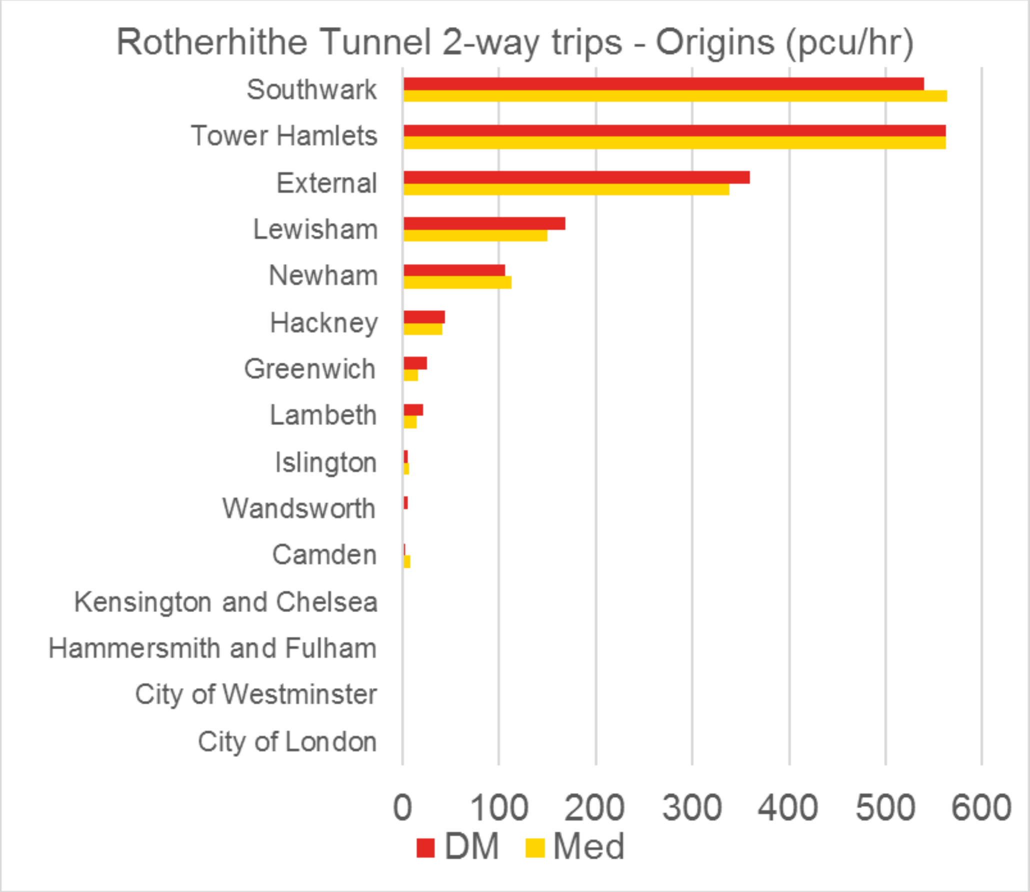
8.2 Rotherhithe Tunnel User's Trip Ends

Two-way select link matrices were extracted from the Do-Minimum and Medium growth scenarios to determine the origins and destinations of all traffic that uses the tunnel in each scenario in the PM peak hour.

8.2.1 Tunnel User's Origins

Figure 48 below displays the total trip origins for all traffic using the tunnel in both directions aggregated by borough.

Figure 48: Rotherhithe Tunnel 2-way trips - Origins



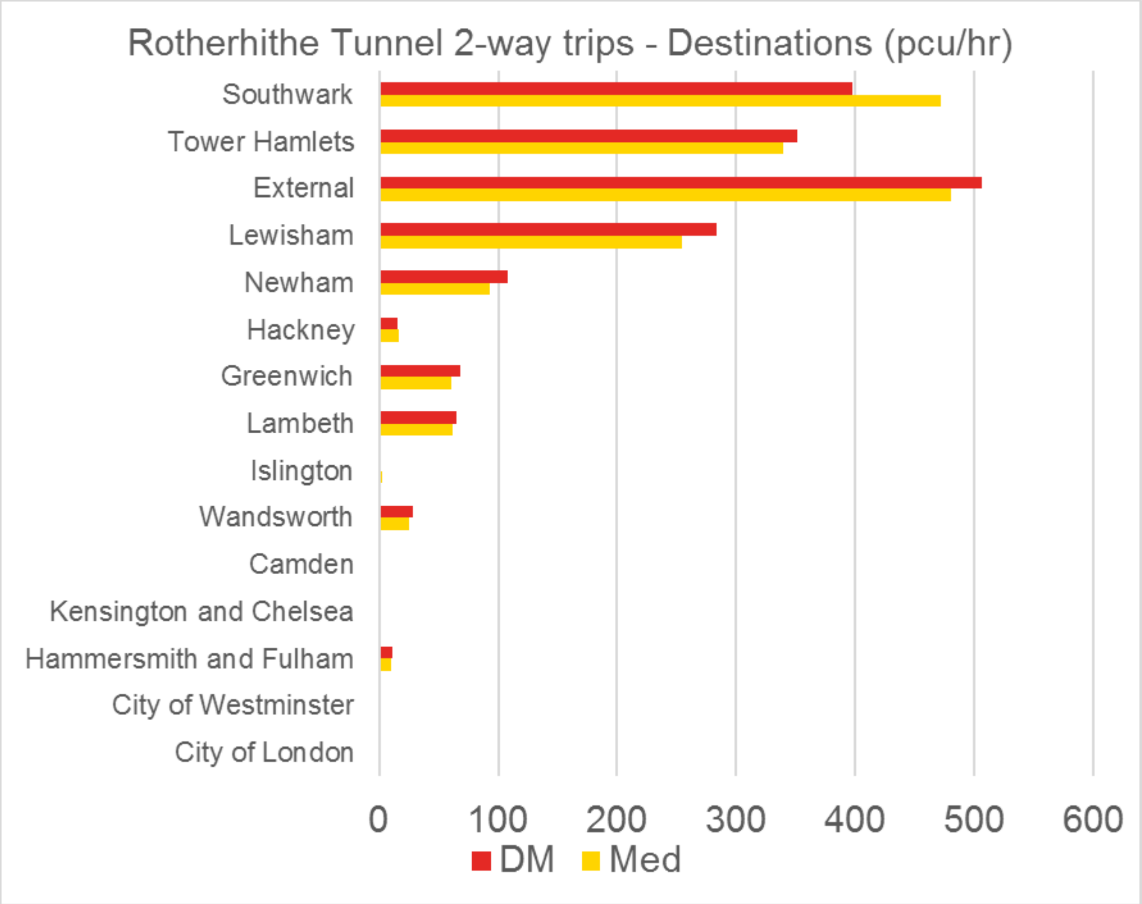
Source: CW_HAM_Sectored comparison_PM_v3_18S_RTFull.xlsx

The figure shows that tunnel users in the PM peak will predominantly start their journey from within Southwark or Tower Hamlets. As the medium growth development is introduced to the Canada Water area (Southwark), trips originating in Southwark increase and due to the finite capacity of the tunnel, external trips decrease to 'make room' for this. Tower Hamlets trips remain constant between scenarios.

8.2.2 Tunnel User's Destinations

Figure 49 below shows the total trip destinations for all traffic using the tunnel in both directions aggregated by borough.

Figure 49: Rotherhithe Tunnel 2-way trips - Destinations



Source: CW_HAM_Sectored comparison_PM_v3_18S_RTFull.xlsx

The figure above shows that a significant proportion of tunnel users in the PM peak have a destination which is external to the boroughs listed above indicating that the tunnel carries a lot of long distance trips which start locally i.e Southwark or Tower Hamlets and end in an external location.

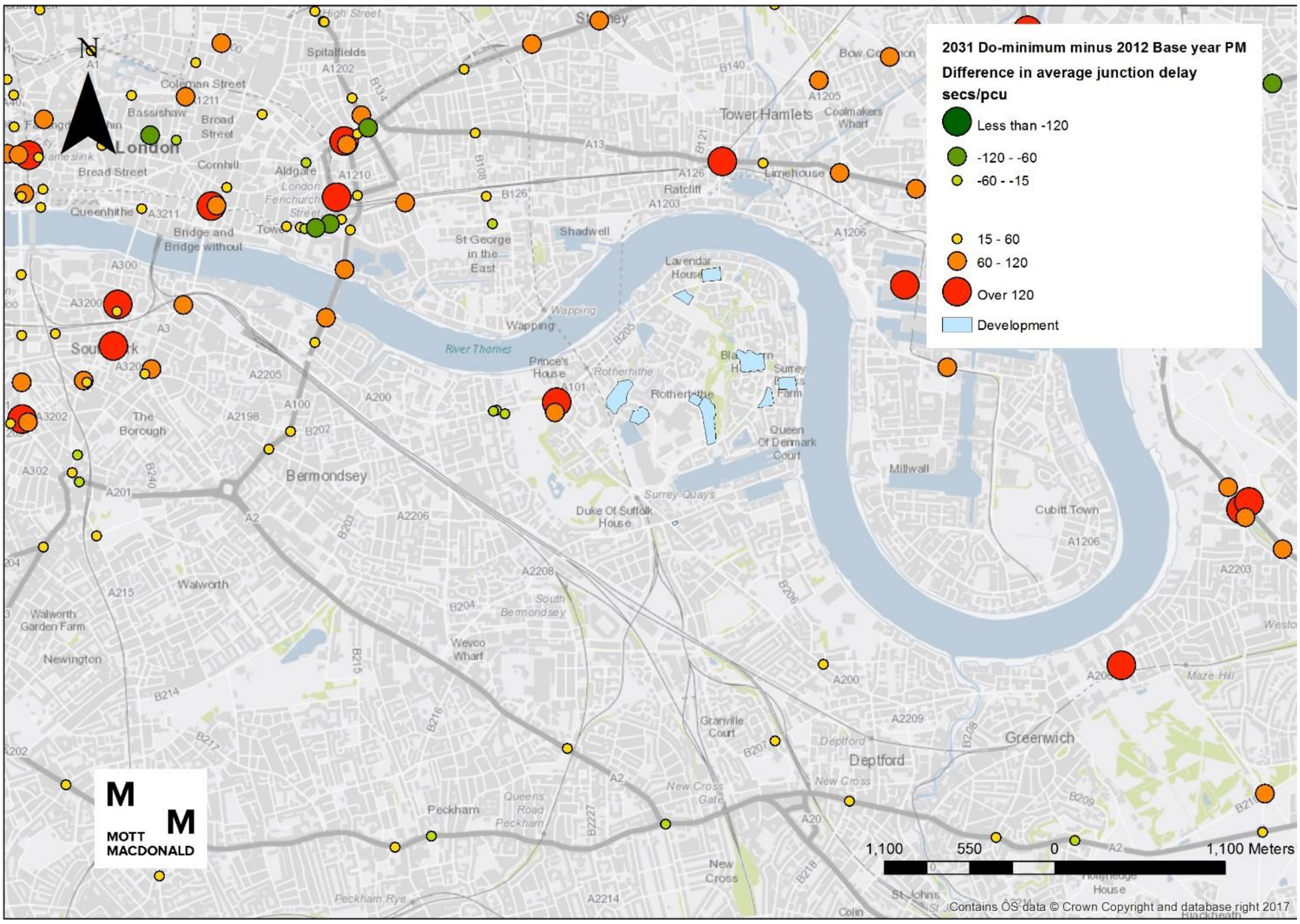
There is a similar effect between scenarios as witnessed with the trip origins whereby there is a significant increase in destinations in Southwark in the Medium growth scenario, with a reduction in external trip destinations to make room for these. As shown in **Table 25**, these longer external trips which no longer use the Rotherhithe Tunnel will re-route to use other crossings.

8.3 Delay differences

The flow-weighted average delay (seconds/pcu) is calculated for each junction in each scenario; the differences in delays between scenarios can then be calculated and displayed in the plots below.

8.3.1 2031 Do-minimum compared with 2012 Base year

Figure 50: 2031 Do-minimum compared with 2012 Base year – Difference in average junction delay (secs/pcu)

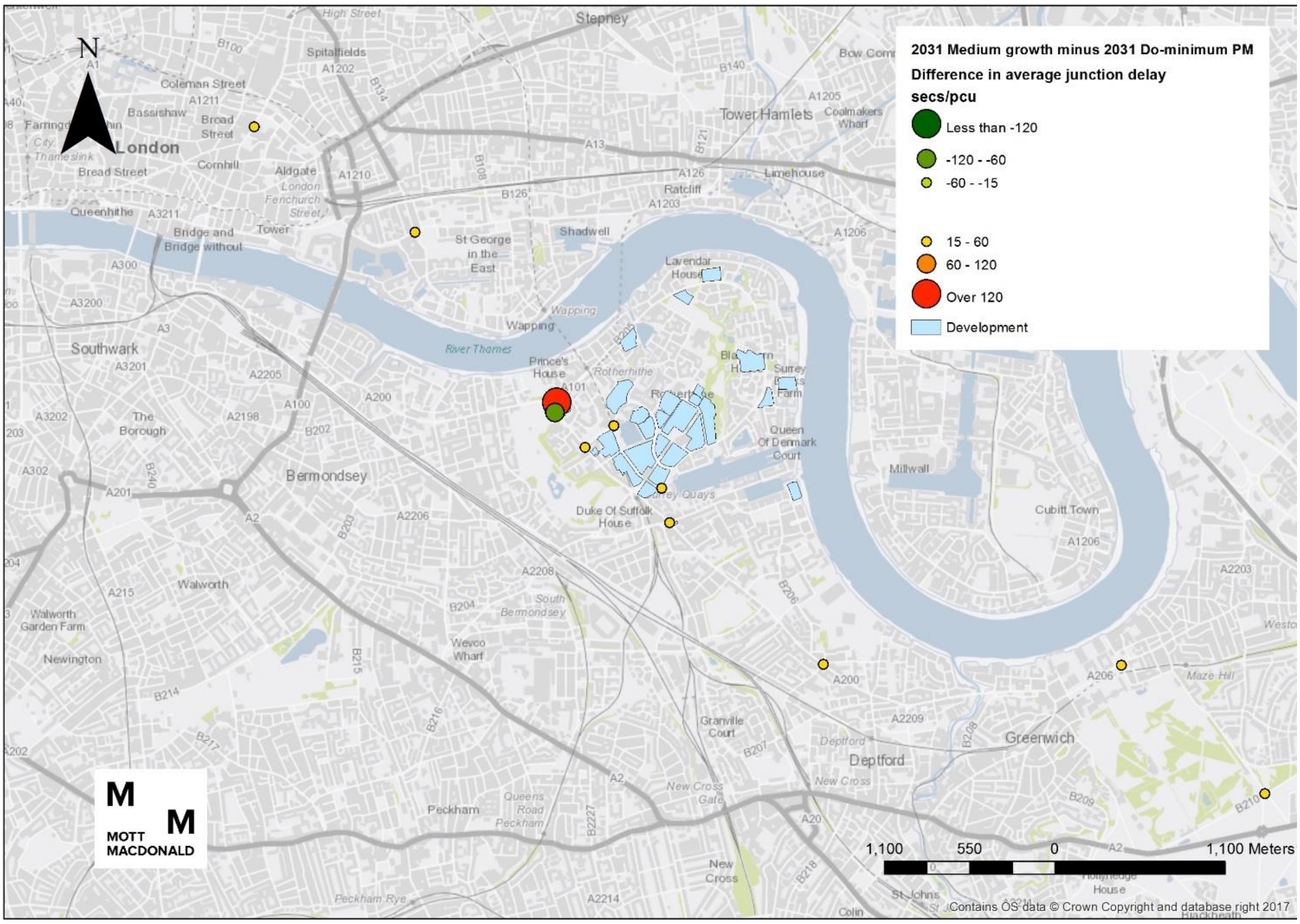


Source: Ordnance Survey data © Crown copyright and database right 2016

Figure 50 shows that between the 2012 base year and the 2031 do-minimum scenario delay is likely to increase at the Rotherhithe Tunnel southern roundabout, this is due to growth in background traffic as there is minimal growth on the peninsula.

8.3.2 2031 Medium growth compared with 2031 Do-minimum

Figure 51: 2031 Medium growth compared with 2031 Do-minimum – Difference in average junction delay (secs/pcu)

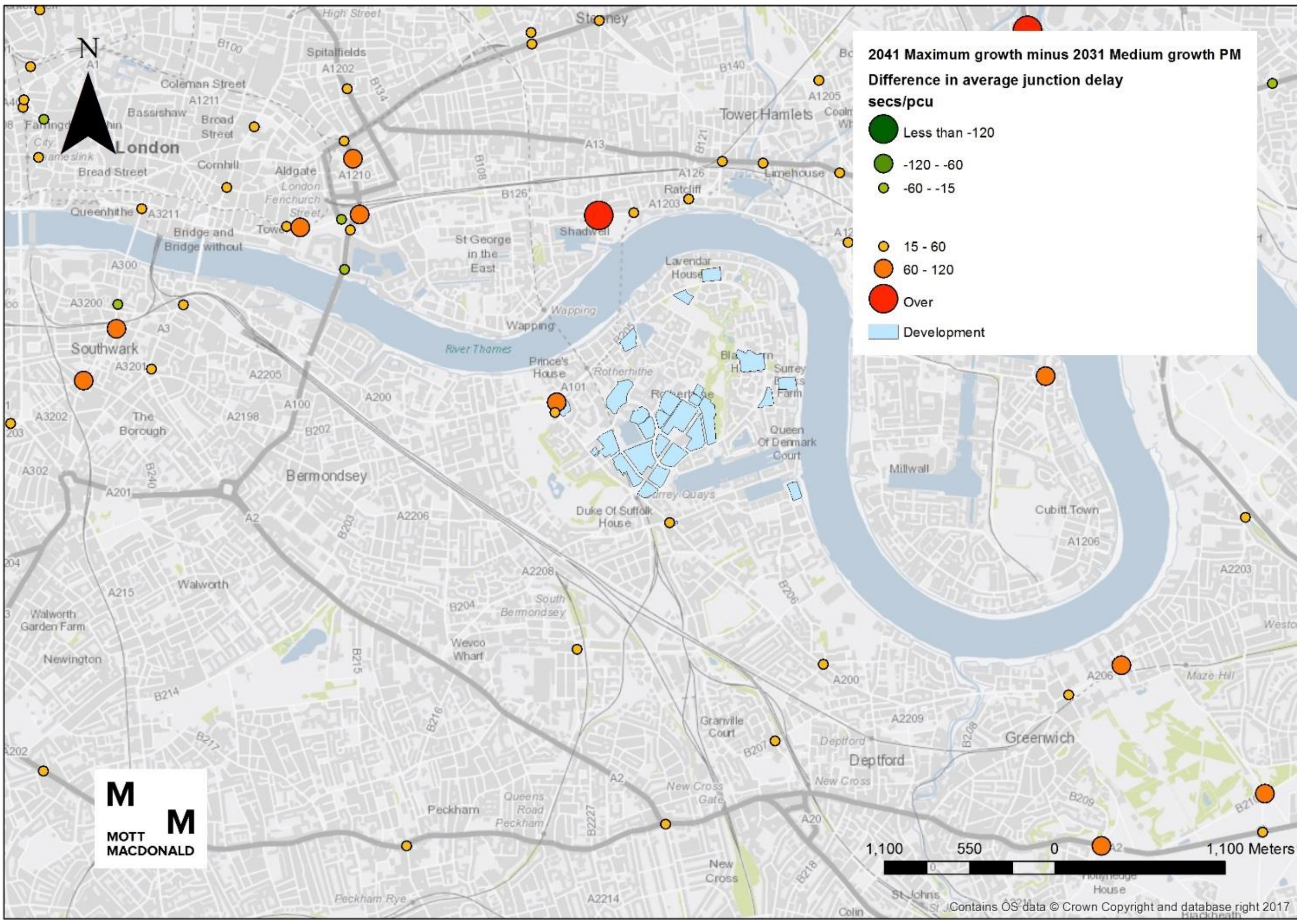


Source: Ordnance Survey data © Crown copyright and database right 2016

When comparing the medium growth scenario with the do-minimum in **Figure 51**, there is a large increase in delay at the northern arm of the roundabout with a minor decrease at the southern arm. The increase in delay at the northern arm is due to development traffic accessing the tunnel via Brunel Road. The decrease in delay at the southern arm is due to a reduction in ‘through’ traffic accessing the tunnel from Lower Road, this therefore reduces delay for traffic accessing Jamaica Road from Lower Road.

8.3.3 2041 Max growth compared with 2031 Medium growth

Figure 52: 2041 Maximum growth compared with 2031 Medium growth – Difference in average junction delay (secs/pcu)



Source: Ordnance Survey data © Crown copyright and database right 2016

It appears that in the 2041 maximum growth scenario, the change in delay effect at the roundabout is compounded when comparing to 2031 medium growth scenario.

8.4 Worst turn volume over capacity

The volume of traffic (pcu/hr) is divided by the calculated capacity (pcu/hr) to give a percentage for each turn at all junctions in the simulation area. **Figure 53** to **Figure 56** display the largest volume/capacity ratio for each junction rather than an average for the whole junction.

8.4.1 2012 Base year

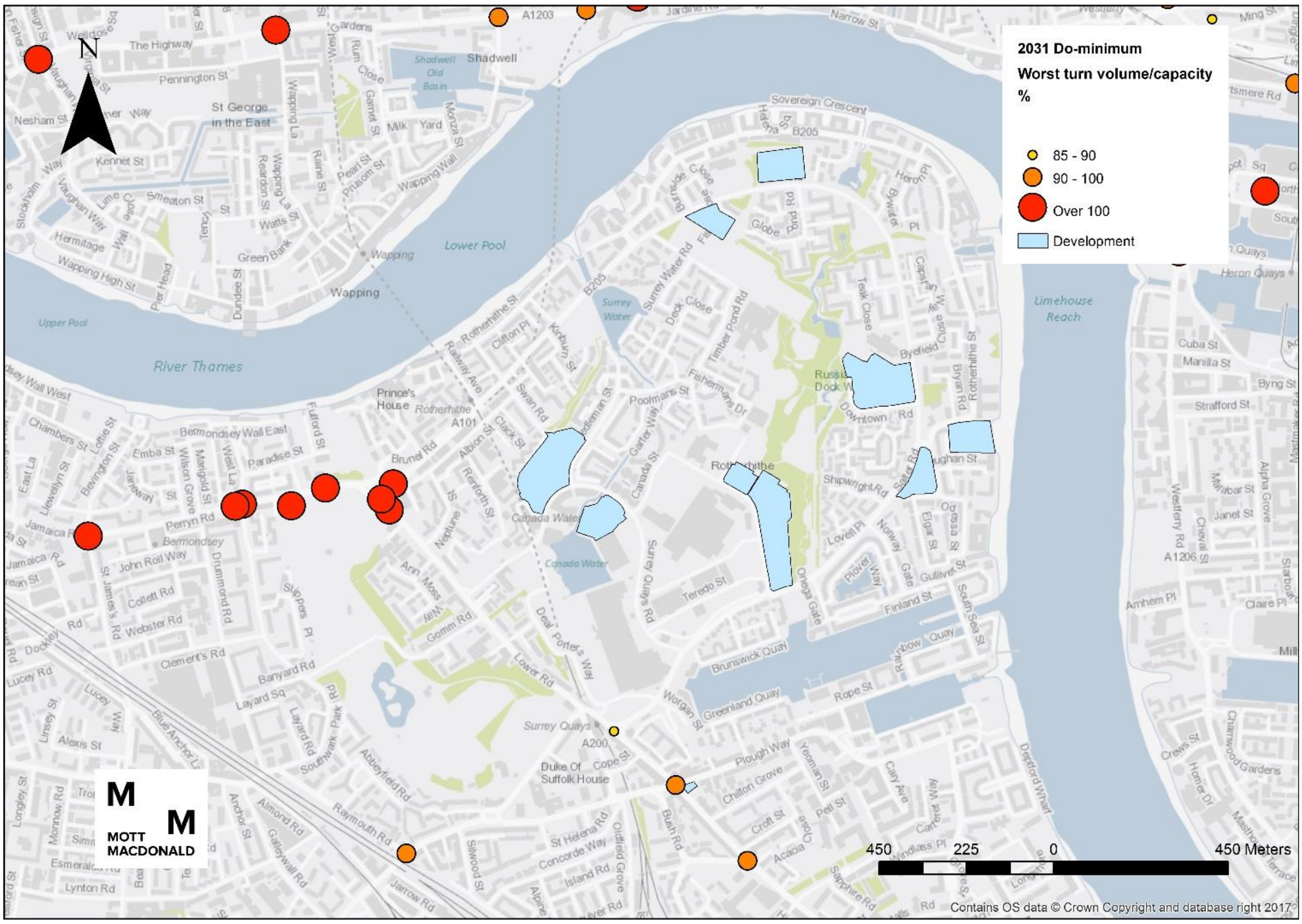
Figure 53: 2012 Base year PM peak hour – worst-turn volume/capacity

Source: Ordnance Survey data © Crown copyright and database right 2016

Figure 53 shows that capacity is substantially exceeded on Jamaica Road heading towards the Rotherhithe Tunnel southern roundabout and also at the roundabout between Evelyn Street, Prince Street and Abinger Grove.

8.4.2 2031 Do-minimum

Figure 54: 2031 Do-minimum PM peak hour – worst-turn volume/capacity

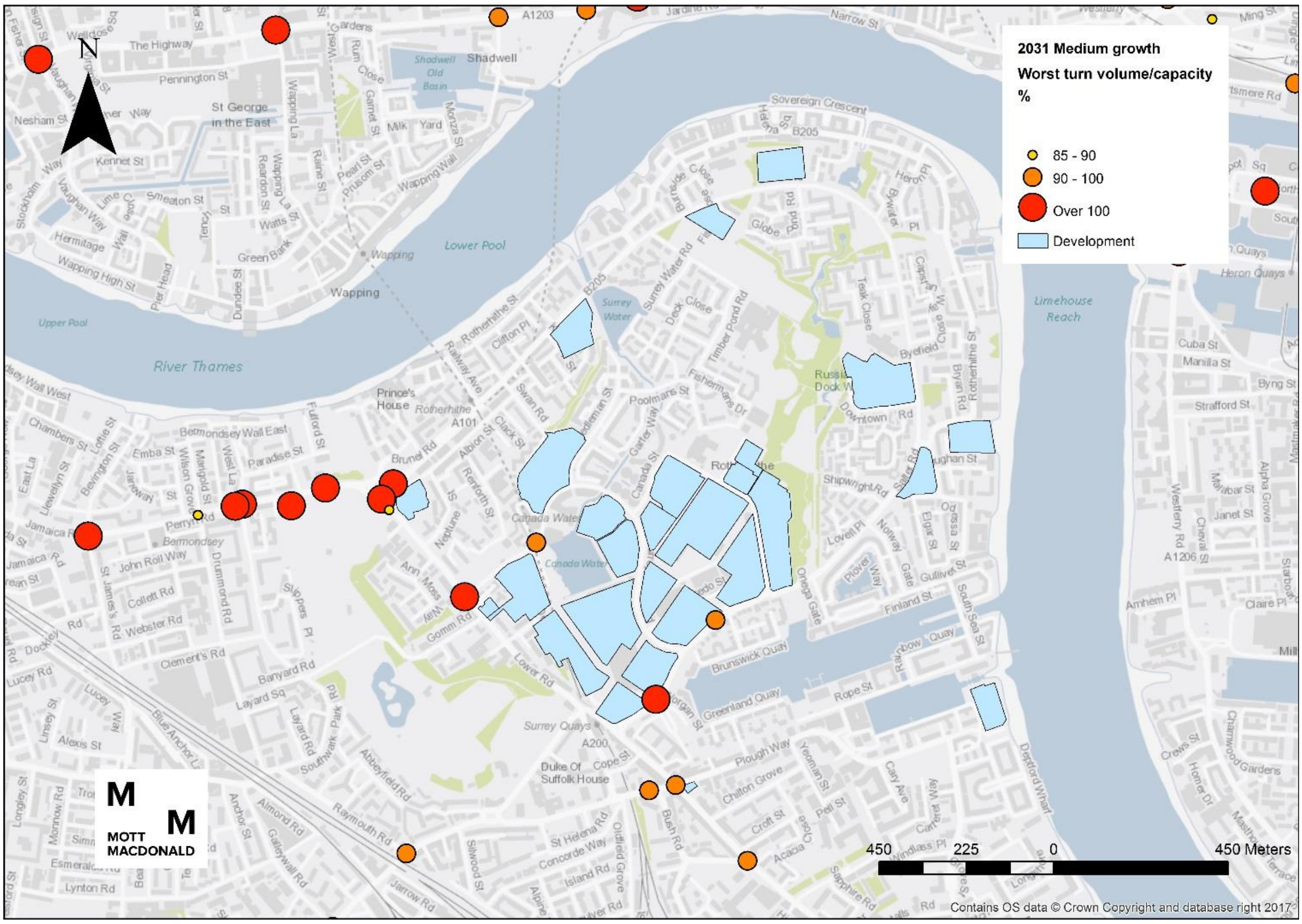


Source: Ordnance Survey data © Crown copyright and database right 2016

The background growth generated in the 2031 do-minimum scenario, as seen in **Figure 54**, results in junctions on Lower Road south of the gyratory approaching capacity i.e. 90-100%.

8.4.3 2031 Medium growth

Figure 55: 2031 Medium growth PM peak hour – worst-turn volume/capacity

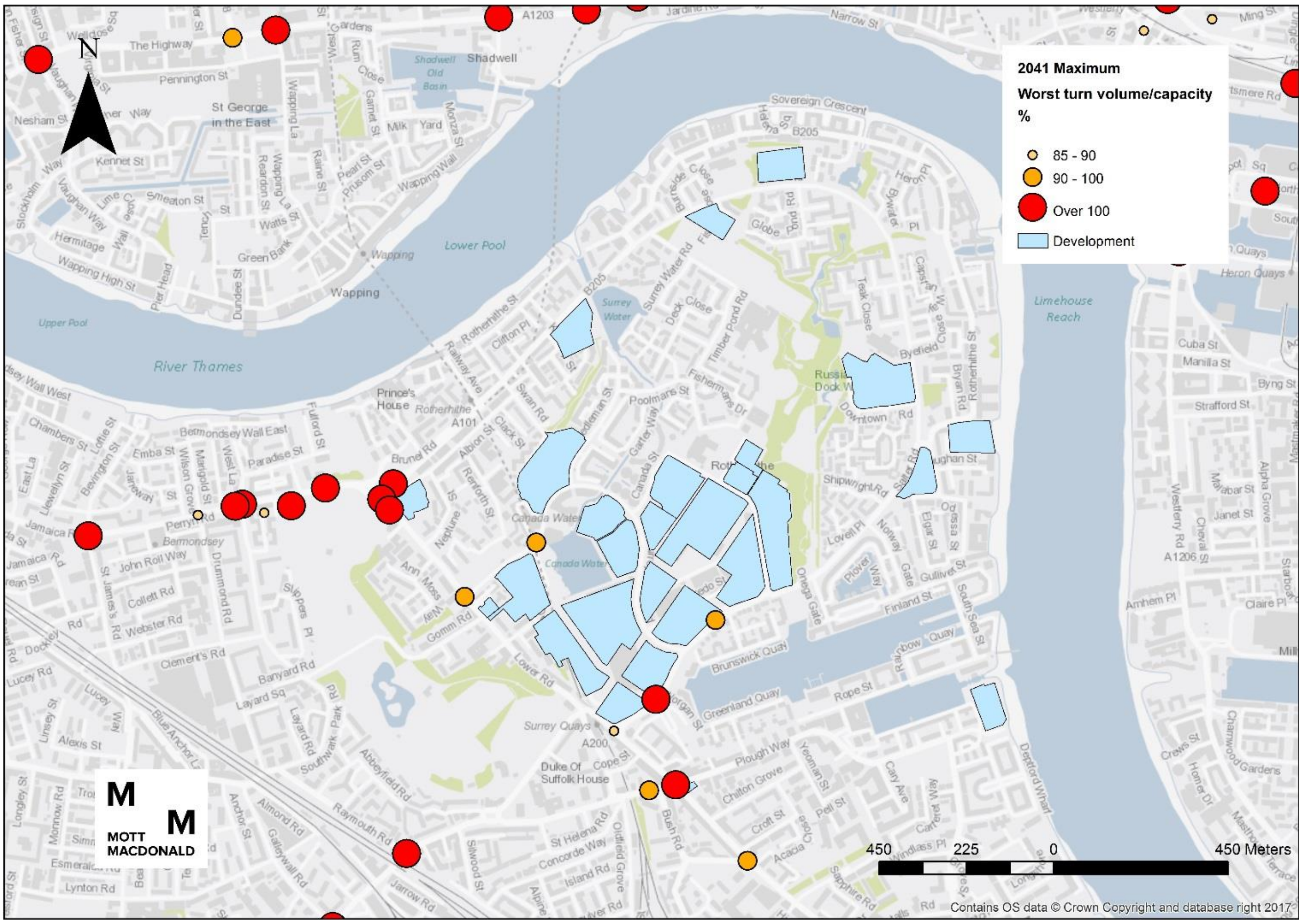


Source: Ordnance Survey data © Crown copyright and database right 2016

The introduction of the Canada Water development largely increases the pressure on the junction between Lower Road and Surrey Quays Road. Pressure also increases on the junctions where development traffic is directly loaded on to the network e.g. Deal Porter's Way junctions with Surrey Quays Road and Redriff Road. The re-routing of through traffic on Lower Road means that pressure on Lower Road at junctions with Plough Way and Croft Street remains the same as the do-minimum.

8.4.4 2041 Max growth

Figure 56: 2041 Maximum growth PM peak hour – worst-turn volume/capacity



Source: Ordnance Survey data © Crown copyright and database right 2016

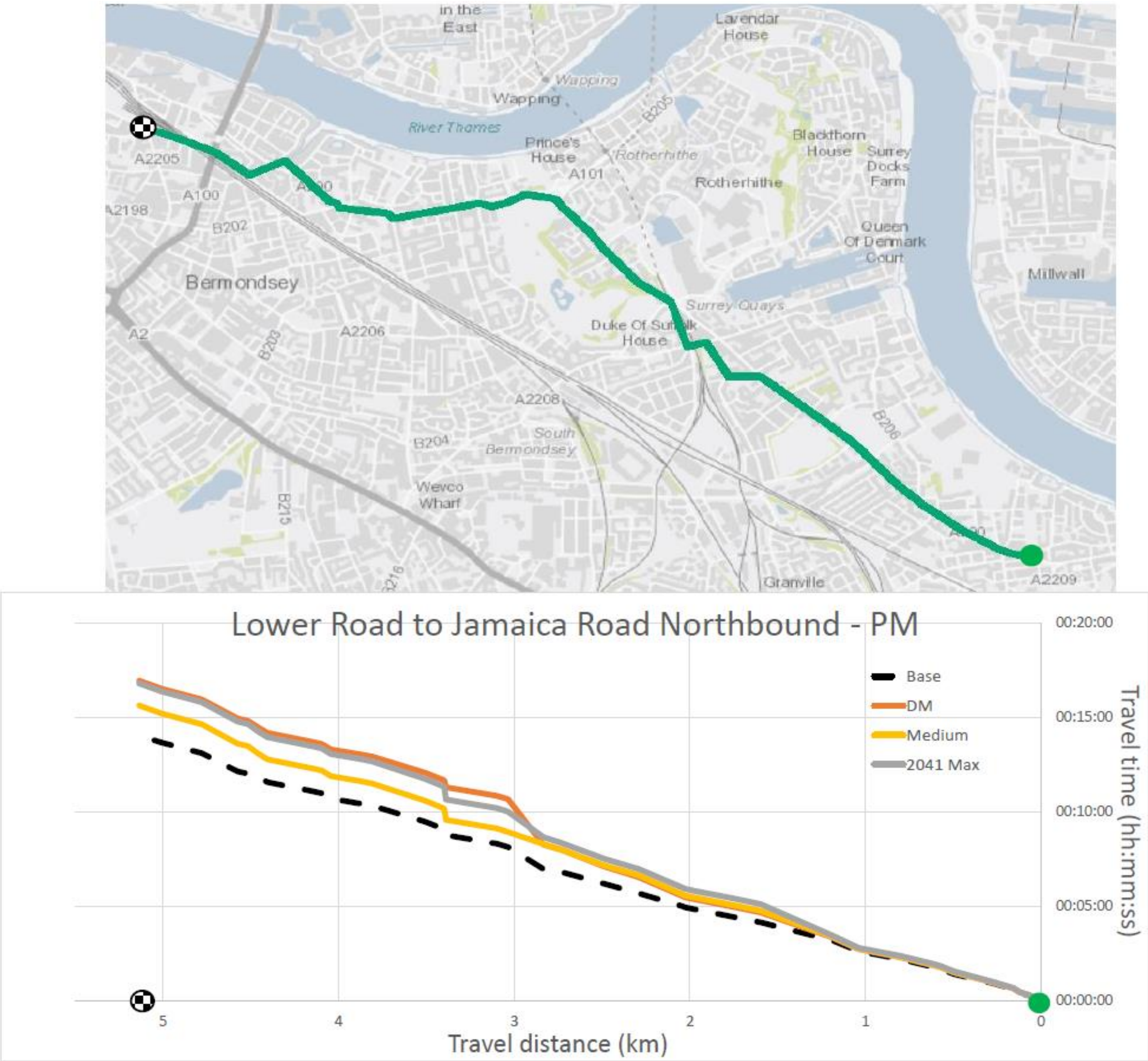
2041 maximum growth seems to exhibit similar levels of pressure on the local Canada Water highway network.

8.5 Journey times

Figure 57 and **Figure 58** display congested journey times along Jamaica Road and Lower Road in both directions for each of the do-minimum, medium and 2041 maximum growth scenarios, along with a comparison to the 2012 base.

8.5.1 Jamaica Road and Lower Road

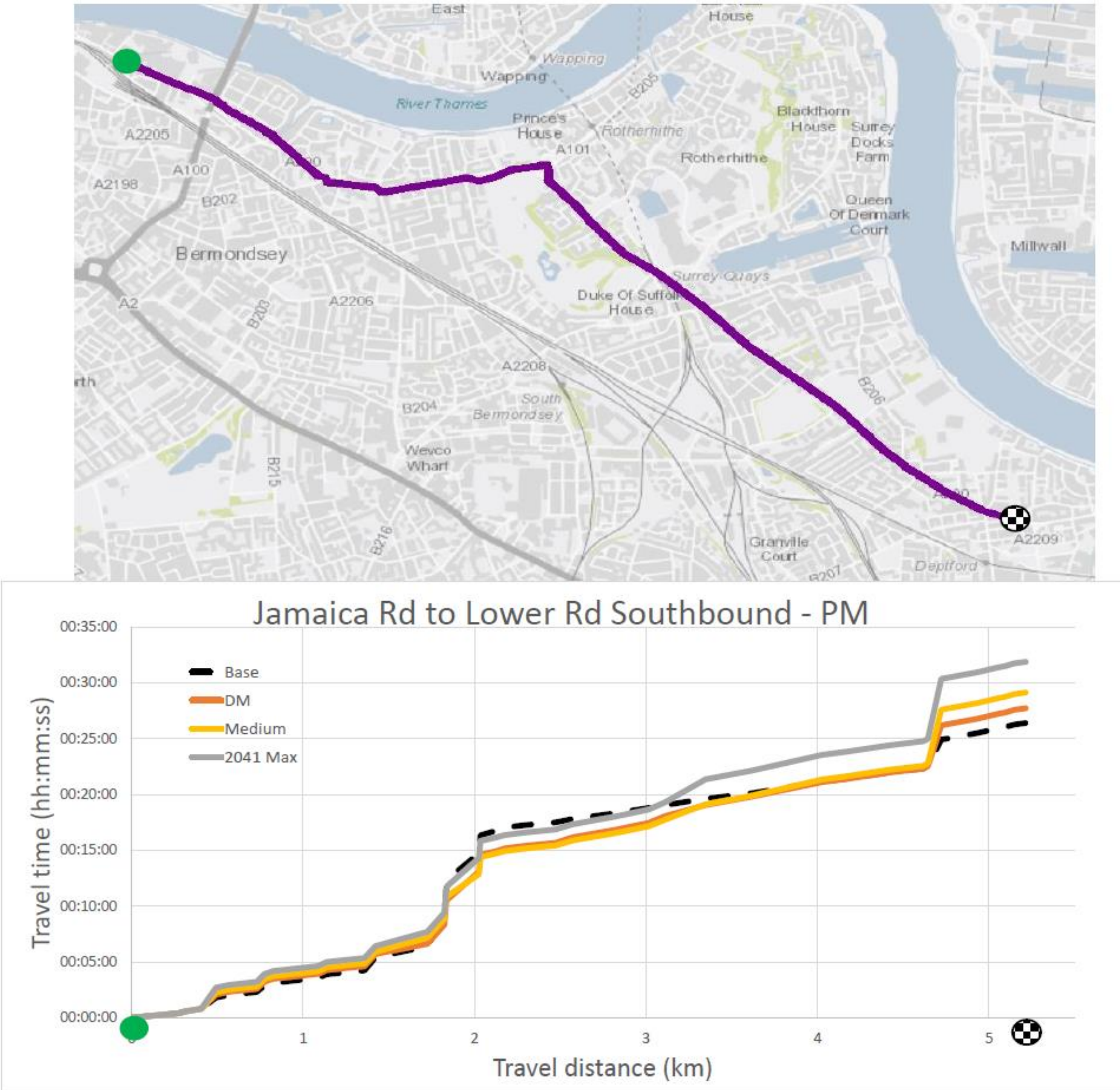
Figure 57: Northbound journey times along Lower Rd and Jamaica Rd



Source: CW Journey Times_PM_v4.xlsx

As shown in **Figure 41**, as development is introduced to Canada Water, there is a reduction of ‘through’ traffic on Lower Road as development traffic takes its place in the tunnel. There is an increase of tunnel traffic accessing the roundabout via Brunel Road and this results in a shift of delay from the southern arm to the northern arm of the roundabout, as seen in **Figure 51**. Less traffic queues at the southern arm of the roundabout on Lower Road aiming to turn right in to the tunnel. This reduction in blocking back allows a reduction in delay from Lower Road on to Jamaica Road and results in a quicker journey time, as seen in **Figure 57**.

Figure 58: Southbound journey times along Jamaica Rd and Lower Rd



Source: CW Journey Times_PM_v4.xlsx

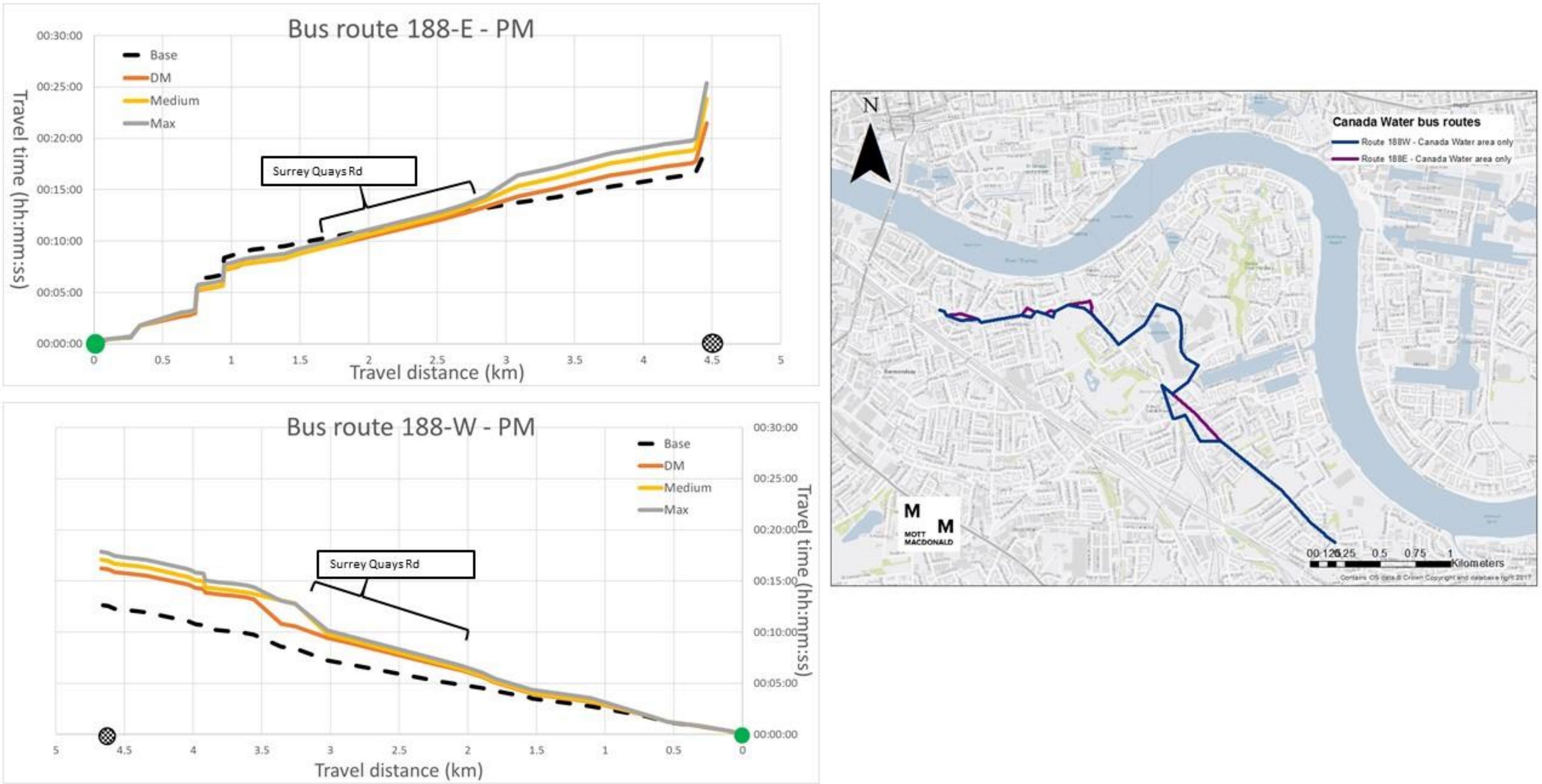
The southbound journey times display as expected significant delay on Jamaica Road leading up to the roundabout with similar levels of delay heading southbound on Lower Road for all scenarios. The introduction of background traffic in 2041 also slows down journey times.

8.5.2 Selected bus routes in the Canada Water area

Figure 59 to **Figure 61** show congested journey times for 3 selected bus routes which travel through the Canada Water area, routes 188, 381 and C10.

Bus route 188 experiences minor additional delay in the medium growth scenario when heading southbound on Redriff Road; this minor delay results in an approximate 2 minute longer journey time for route 188 heading eastbound for the section shown in **Figure 59**. Westbound delays are experienced in similar locations and result in an additional 1 minute to the westbound journey time for the section shown below.

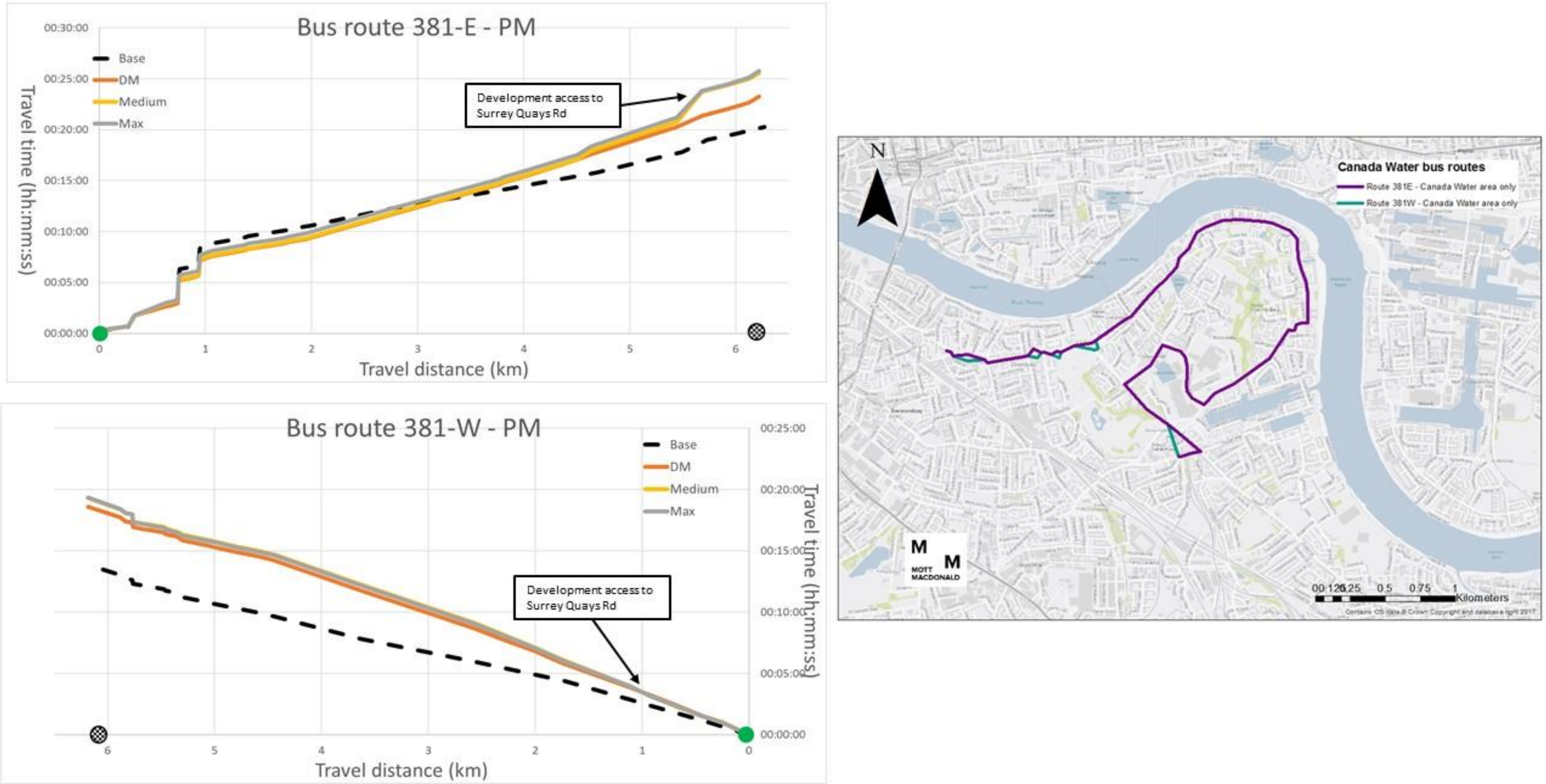
Figure 59: Bus route 188 – PM peak



Source: CW Bus Journey Times_PM_v4_chop.xlsx

Westbound bus journey times for route 381 appear to be relatively unaffected by the introduction of development to the Canada Water area. However, the eastbound route heads southbound along Surrey Quays Road and accesses Lower Road using the junction which is operating nearly at capacity, this results in an additional 2.5 minutes to the eastbound bus journey time for the section shown in **Figure 60**.

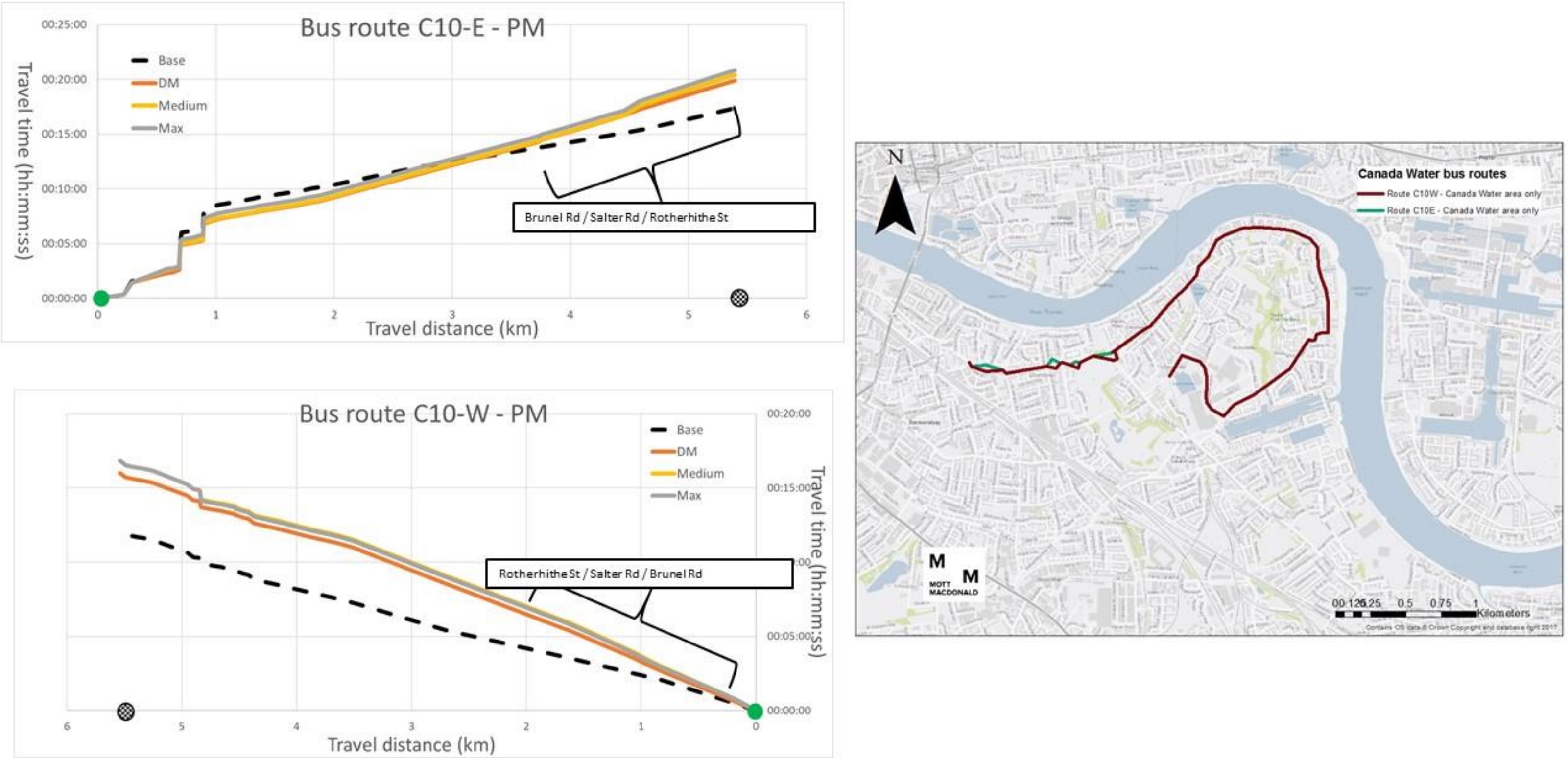
Figure 60: Bus route 381 – PM peak



Source: CW Bus Journey Times_PM_v4_chop.xlsx

Bus route C10 follows a very similar route to 381, as seen in **Figure 60**; this means that it displays very similar patterns of delay. However, route C10 terminates at the bus station just off Surrey Quays Road and therefore does not use the Surrey Quays Road/Lower Road junction, meaning that this route experiences less delay than 381 resulting in only a 30 second increase in eastbound journey time in the medium growth scenario when comparing to the do-minimum over the section shown in **Figure 61**.

Figure 61: Bus route C10 – PM peak



Source: CW Bus Journey Times_PM_v4_chop.xlsx

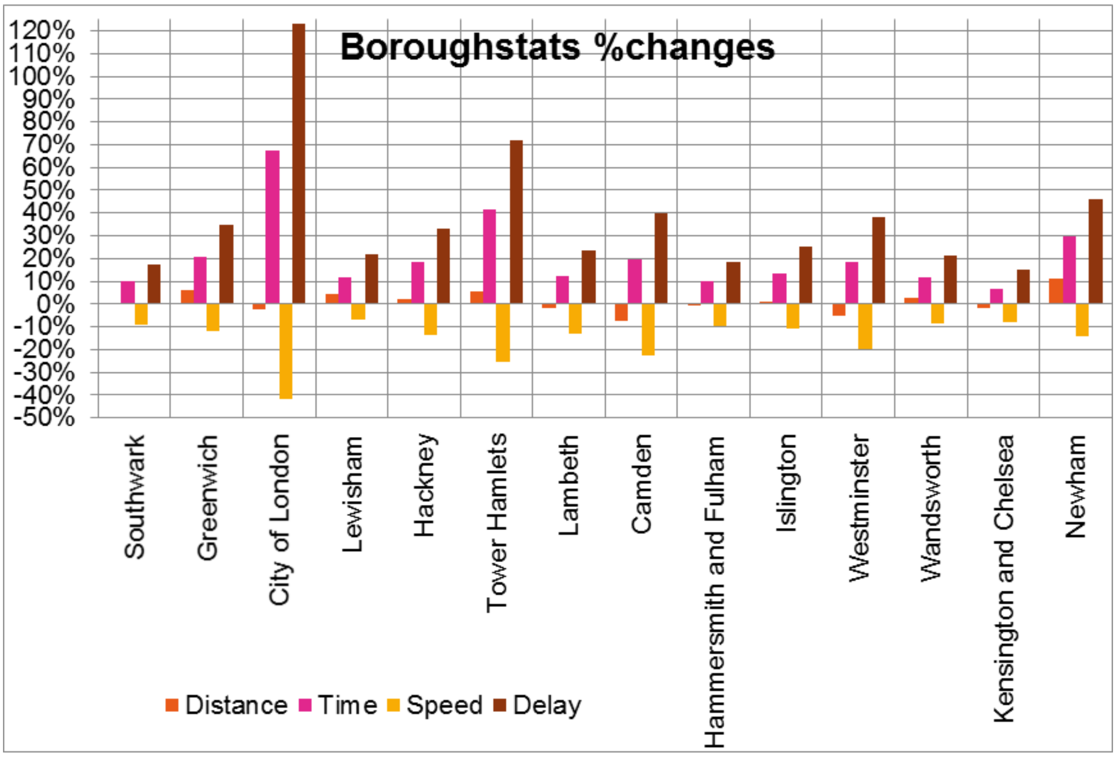
8.6 Borough-wide Statistics

TfL provided a VBA macro which extracts the changes in travel distance, travel time, average speed and delay experienced in the model between two scenarios, aggregated by borough. Fourteen boroughs have been selected and the changes experienced between scenarios are displayed below.

8.6.1 2031 Do-minimum compared with 2012 Base year

Figure 62 below shows the percentage change in distance, time, speed and delay in each of the fourteen boroughs, when comparing the 2031 do-minimum scenario with the 2012 base year and therefore incorporates a significant amount of background growth.

Figure 62: 2031 Do-Minimum compared with 2012 Base year



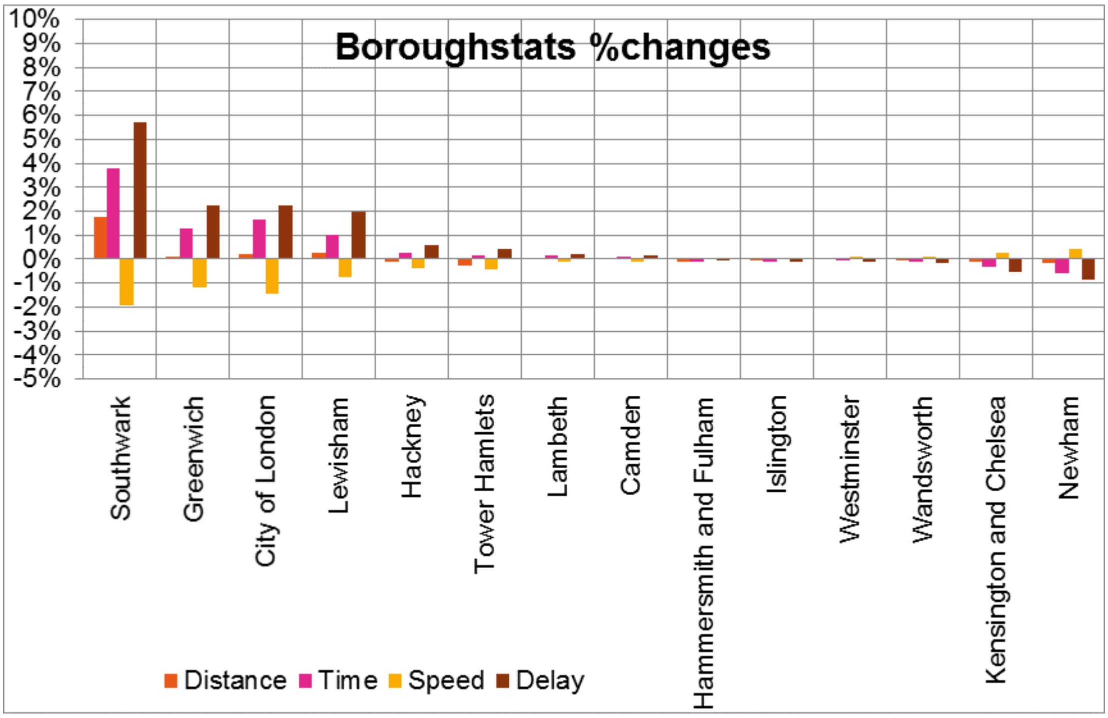
Source: HAM_BoroStats_3.8 - CW_Base_DM.xlsm

As seen above, a lot of the background growth and possible reductions in road space capacity through schemes introduced to the network between 2012 and 2031 result in large increases in travel time and delay and corresponding reductions in average speed in the City of London in particular. Southwark experiences relatively low levels of delay and travel time increases in comparison. Full statistics can be seen in **Appendix A**.

8.6.2 2031 Medium growth compared with 2031 Do-Minimum

Figure 63 compares the medium growth scenario and the do-minimum scenario and thus displays the effect the development traffic will have on travel time, travel distance, speed and delay in each of the boroughs. Please note the change in axis scale to the above due to more minor changes in comparison.

Figure 63: 2031 Medium growth compared with 2031 Do-Minimum



Source: HAM_BoroStats_3.8 - CW_DM_Med.xlsm

The figure above shows expected increases in delay and travel time in Southwark as the development traffic will either start or end their journeys from within this borough. There are also increases in Greenwich, City of London and Lewisham as a result of the distribution of development trips, as seen in **Section 6.5.3**. Full statistics can be seen in **Appendix A**.

8.7 Overall Development Scenario Analysis

Additional analysis assessing the overall trip generation, trip distribution and trip assignment in the Canada Water area has been undertaken and described below.

8.7.1 Highway development trip generation

Development in the medium growth scenario generates an additional (2,371 – 1,620 =) 751 pcus/hr trips leaving the Canada Water area in the PM peak (**Table 19**). Of these additional 751 pcus/hr origin trips, approximately 59% are made using a private car (**Table 21** – ((246-137)+(1,459-1,132))/751 = 59%).

Table 26 shows the number of trips leaving the Canada Water peninsula in the PM peak hour split by highway user classes. A portion of the highway growth between the Do-Minimum and Medium growth scenarios is attributable to LGV and OGV trips. There appears to be a minor shift in composition away from out of work (commuter) car trips towards employment trips in cars, LGVs and OGVs. This is possibly due to a shift in land use towards more commercial and office floorspace.

Table 26: Peninsula trip origins by user class (pcu/hr)

User Class	DM	DM (%)	Med	Med (%)
Car – In Work Time	137	9%	246	10%
Car – Out of Work Time	1,132	70%	1,459	62%
Taxi	64	4%	64	3%

User Class	DM	DM (%)	Med	Med (%)
LGV	228	14%	500	21%
OGV	59	3%	101	4%
Total	1,620	100%	2,371	100%

Source: CW_HAM_Sectored comparison_PM_v3_18Sectors.xlsx

The overall arrival trip 'rate' (i.e. trips arriving per home) for the entire peninsula has dropped between the Do-Minimum and Medium growth scenarios due to the introduction of 'low-car' developments in the medium growth scenario:

- Do-minimum – **0.21 trips per home** (1,396 trips arriving/6,676 homes)
- Medium growth – **0.15 trips per home** (1,937 trips arriving/12,707 homes)

Due to the large share of private car driver trips generated in the PM peak hour (59% of additional highway trips – 436 pcus/hr), there may be scope to discourage the use of the private car through travel demand management and thus reduce the number of car trips in the local area and resultant stress on the network. This could be focused on not only the new development trips but also existing car trips in the area with an aim to reduce network stress.

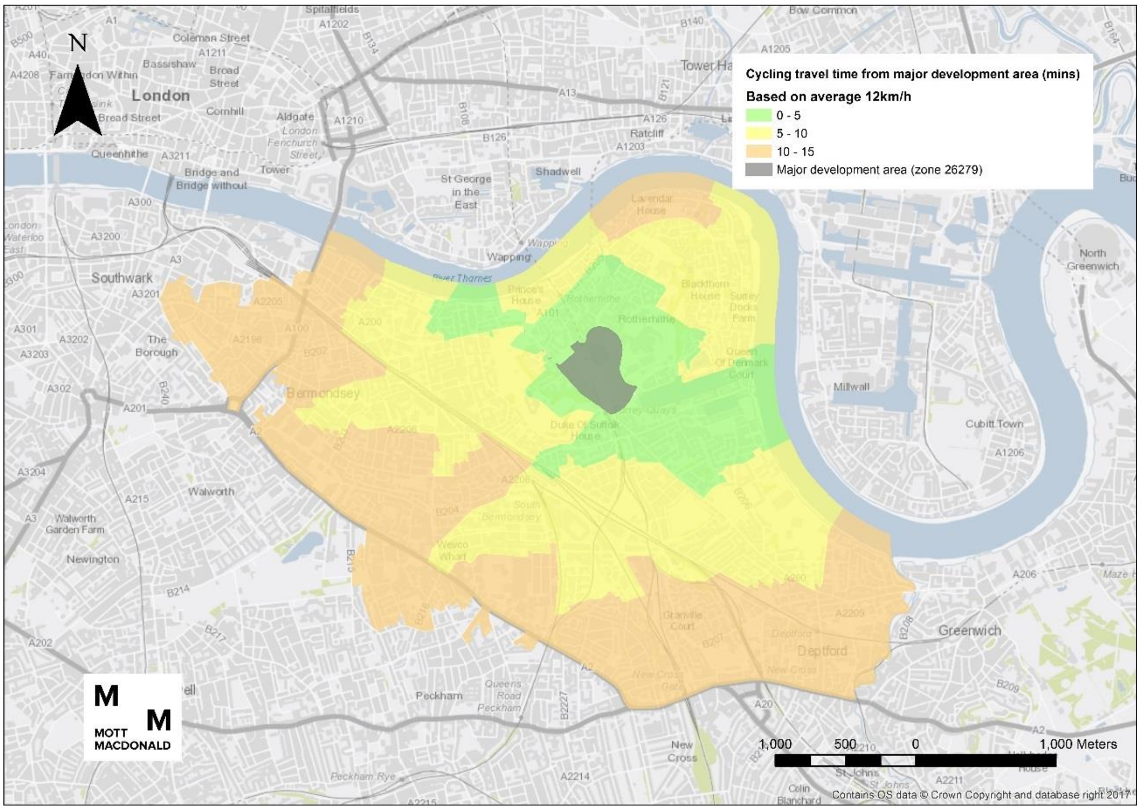
8.7.2 Highway development trip distribution

Table 23 and **Figure 30** show that a large proportion of highway trips leave the peninsula and have relatively short distance trips to north Southwark and Lewisham. It is possible that some of these shorter distance trips could be done by active travel modes such as walking or cycling.

Figure 64 below displays cycling travel time isochrones from the zone which contains the largest amount of planned development in the medium growth scenario. The travel times are based on the minimum highway network distance (it is assumed highway congestion will not impact cycle route choice) and an assumed average cycle speed of 12km/h. The highway network doesn't contain any cycle-only links and these travel times are therefore an under-estimate and are likely to be faster.

Figure 64 also displays the number of car trips which are leaving the major development zone in the PM peak, these are compared with how long an equivalent cycle trip would take. **Table 27** summarises the number of trips going to and from the zone in each cycle travel time band. The table shows that a significant number of car trips are being made where short cycling trips could be made. As described in **Section 9.2**, travel demand management could be used to discourage these short car trips and car drivers and car passengers could be encouraged to cycle to relieve local area network stress.

Figure 64: Cycling travel times from major development area zone (assumed 12km/h average speed)



Source: Ordnance Survey data © Crown copyright and database right 2016

Table 27: Car trips to and from the development area in the PM peak medium growth scenario banded by cycle travel time

Cycling travel time (mins)	Car trips from development area (pcu/hr)	Car trips to development area (pcu/hr)	Total (pcu/hr)
0-5	92	27	120
5-10	139	51	190
10-15	82	33	115
Over 15	469	112	581
Total	782	224	1006

Source: CW_Med_PM_Car trips banded by cycle time.xlsx

Section 6.5.3 also displays proportions of trips going to and coming from locations on the north side of the river in the City of London and Tower Hamlets. It is likely that the large majority of these trips will use the Rotherhithe Tunnel; this is the obvious routing choice as the crossing is within close proximity to the development site. Whilst it is possible for cycling trips to be made to the north side of the river via the Rotherhithe Tunnel, the user experience often discourages this.

All other trip distribution seems sensible as it is expected there will be a small proportion of long distance highway trips to and from the peninsula; as seen in **Table 23**, the spread of long distance trips (to 'West', 'North', 'East' and 'South') appears to show a small majority heading to the East.

8.7.3 Highway development trip assignment

Figure 46 displays a fairly even split of medium growth development traffic aiming to use the Rotherhithe Tunnel, Jamaica Road westbound and Lower Road southbound. However, the ‘logical’ routing choice for traffic leaving the development and travelling towards either Jamaica Road or the Tunnel is to access Lower Road from Surrey Quays Road; as a large proportion of traffic leaving the development uses either Jamaica Road or the tunnel, this junction therefore approaches capacity. An attractive alternative option to using the Surrey Quays Road/Lower Road junction is to use Salter Road and Brunel Road and thus flow increases on this route as soon as any reasonable levels of delay are experienced at this junction; flow differences are seen in **Figure 41** and delay differences in **Figure 51**. As seen in **Figure 51**, the re-routing around Salter Road also has an impact on locations of delay at the roundabout at the southern end of the tunnel.

Development traffic in the medium growth scenario uses the Rotherhithe Tunnel’s capacity which in turn results in a reduction of long distance ‘through’ traffic accessing the tunnel from Lower Road in particular. As displayed in **Table 25**, the introduction of development has a very minor ‘knock-on’ impact on other river crossings with minor increases northbound on London and Tower Bridge. However, the approaches to several river crossings in London, such as the Blackwall Tunnel and Southwark Bridge operate at capacity and it is therefore possible that re-routed traffic is delayed by queueing traffic on the approach to the crossings and not able to cross in the time period.

Journey time routes along Lower Road and Jamaica Road appear to be unaffected by the development. However, bus routes which pass through junctions where development traffic is either directly loaded or heavily routed through, see minor increases in delay, bus routes 381 eastbound, and 188 in both directions in particular.

9 Development scenario conclusions

9.1 Public transport development scenario conclusions

Development in the Medium growth scenario generates an additional (7,342 – 3,227 =) 4,115 PT trips from the development area, and (13,177 – 2,842) = 10,353 PT trips to the development area in the AM Peak (**Table 13**). The substantial increase in jobs over the Do-Minimum scenario accounts for the large number of trips occurring to the OA.

Analysis of PT sub-mode share (**Figure 38**) shows that the Jubilee line is the main public transport mode choice both to and from the OA, with trips predominantly occurring to and from the West (Central London). For the Overground, passengers mostly use Surrey Quays to access the OA (from both directions), but Canada Water to leave the OA (since most trips leaving the area are northbound). Buses account for the remaining 10% of trips to and from the OA.

The Jubilee line is highly stressed in the Do-Minimum scenario (**Figure 35**), and conditions worsen further in the Medium scenario, especially on approach to Canada Water. Conditions on Eastbound movements are amongst the worst across all of London, particularly towards Canary Wharf as this is compounded by interchange movements onto the Jubilee Line from the Overground, which more than double between the Do-Minimum and Medium scenarios (**Figure 36**). In fact, for Canada Water to Canary Wharf crowding drops between the Do-Minimum and Medium scenarios as passengers are being crowded off the Jubilee line.

Overall it appears that the Elizabeth line helps significantly to meet the background growth in demand between 2011 and 2031 (**Figure 34**), however with the additional trips at Canada Water arising from the development the Jubilee line becomes severely crowded and there are significant increases in station movements at Canada Water and Surrey Quays which require attention.

9.2 Highway development scenario conclusions

Highway trip generation in the Canada Water reveals a shift from out of work private car trips towards business trips in private cars and LGVs. This is reflective of the change in land use in the area in the medium growth scenario. There is also a sensible level of highway trip growth in the area as a result of the additional development given the additional homes and jobs in the area and existing public transport or active travel provision.

There is a significant amount of through traffic on Lower Road aiming to cross the river in both directions using the Rotherhithe Tunnel. The development demand reduces longer distance through traffic as local traffic uses the capacity of the tunnel instead, this is revealed in **Figure 46** and **Figure 47**.

The medium growth development demand increases junction delay and stress on the network where the demand is either directly loaded or a significant portion passes through (Lower Road/Surrey Quays Road junction and Lower Road/Redriff Road junction), this is shown in **Figure 51**.

There is an increase in flow routing around Salter Road to access the Rotherhithe Tunnel roundabout via Brunel Road, this shifts delay to the northern arm and reduces delay on the Lower Road approach, this is also shown in **Figure 51**. This shift in delay improves northbound journey times along Lower Road, as shown in **Figure 57**.

There are overall increases in delay at a borough level following the introduction of the medium growth development demand, as shown in **Figure 63**.

However, as shown in **Section 8.7**, there is potential to shift a significant number of short distance trips to more sustainable modes through the use of travel demand management in the area.

10 Public Transport intervention testing

10.1 Rail interventions

The Do Minimum and Medium Development scenarios represent consistent unmitigated transport networks. They both include a number of committed schemes and upgrades which have a direct impact on patterns of demand along the Jubilee and Overground line corridors, such as the Elizabeth Line.

In response to the areas of network stress and worsened transport conditions due to the development, other potential (unfunded and uncommitted) rail interventions have been assessed which could alleviate the modelled impacts on travel patterns. This section summarises the public transport intervention testing which has been carried out in Railplan evaluating these uncommitted schemes, based on the 2031 Medium Development scenario.

10.1.1 Intervention tests

The following outlines the nine intervention tests[10] which have been carried out, independently of one another:

1. Increase Jubilee Line frequency from 34tph to 36tph (CQ601A312)
2. Increase Elizabeth Line frequency through core from 24tph to 32tph (CQ602A312)
3. Increase Overground Line core frequency from 16tph to 20tph (CQ603A312)
4. Increase Overground Line core frequency from 16tph to 24tph (CQ604A312)
5. Move Surrey Quays station entrance north across Lower Road, closer to the development site (CQ605A312)
6. Increase DLR service frequency between Lewisham and Stratford/Bank from 22.5tph to 30tph (CQ606A312)
7. Reduce interchange distances at Shadwell from 230m to 140m (CQ607A312)
8. Stop some Thameslink services at stations along ELL (CQ608A312)
9. Add Brimmington Park station with some Southern and Overground services stopping (CQ609A312)

Further to these, Railplan outputs from existing modelling have been analysed to understand the impacts of (i) Bakerloo Line Extension, and (ii) Crossrail 2.

10.1.1.1 Tests 1, 2, 3, 4 and 6

Tests 1, 2, 3, 4 and 6 involve frequency increases to relieve, either directly or indirectly, crowding conditions through Canada Water station. The Jubilee and Overground lines directly impact crowding at Canada Water, and so the aim of these tests is to add capacity through the station to improve crowding conditions; the DLR and Elizabeth lines compete with the Jubilee Line in serving Canary Wharf, and therefore the aim here is to attract passengers away from the Jubilee Line, and specifically at Canada Water, by adding capacity to the competing lines. In the case of the Jubilee Line and DLR, incremental increases have been applied to the existing coding; for the Elizabeth Line and Overground, TfL has specified[11] frequency changes included in a wider re-cast of services which affects the start/end points of these individual services on these routes

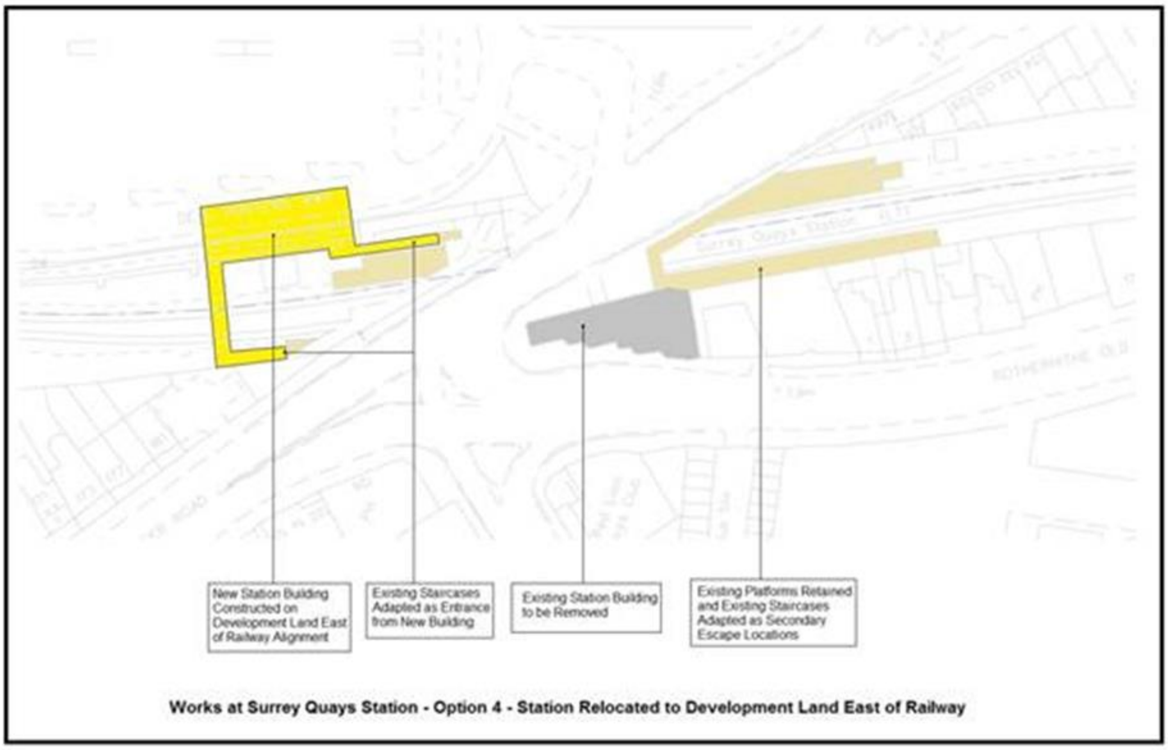
[10] “20170801 CW committed and uncommitted rail v3_mm.doc”

[11] “170602 note on rail mitigations for Canada Water Development as.docx”

10.1.1.2 Test 5

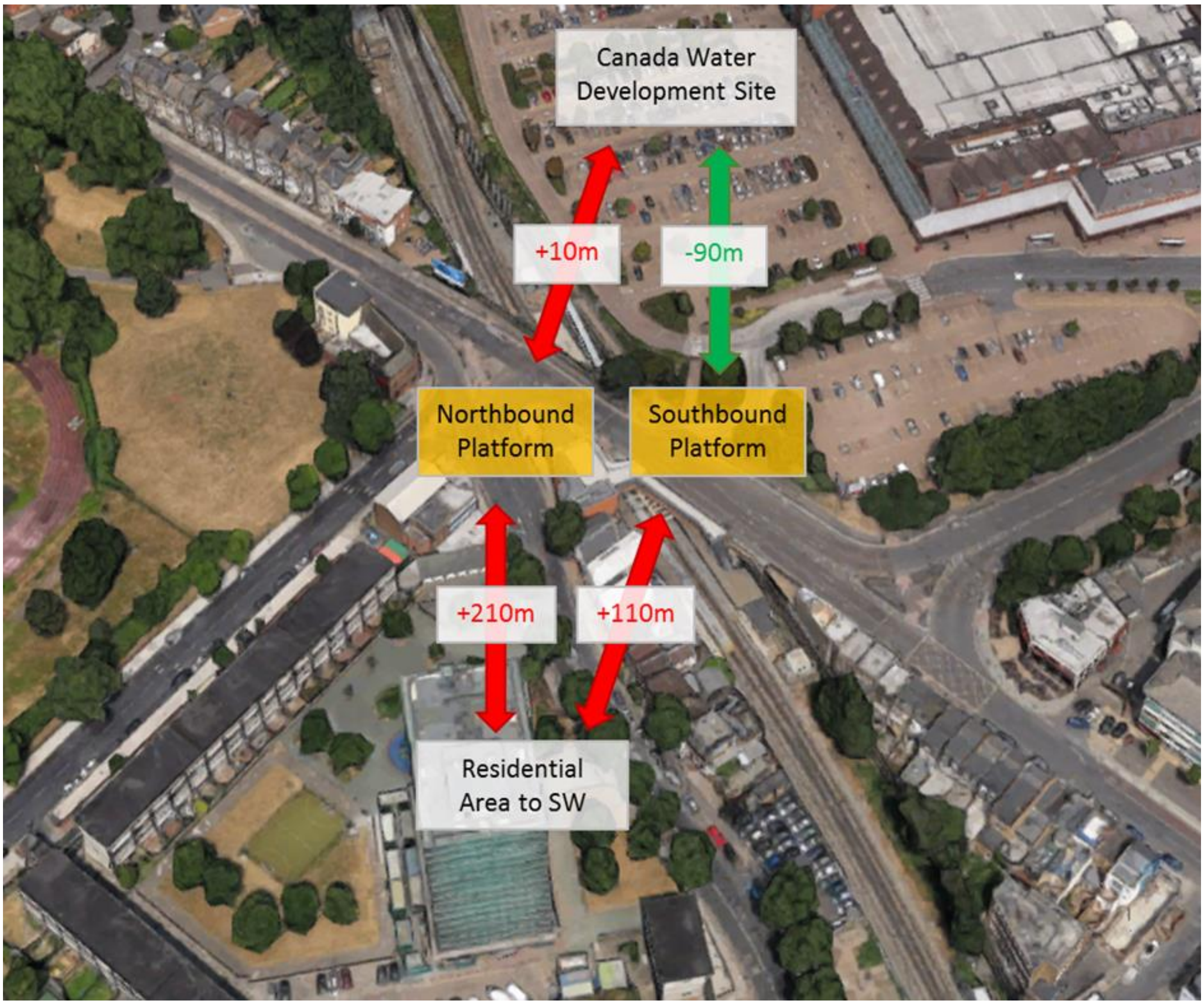
Test 5 repositions the entrance to Surrey Quays station to better serve and integrate with the new High Street and OA developments, by removing the existing entrance and opening a new one north across Lower Road, providing an alternative to Canada Water station. This is shown in **Figure 65**.

Figure 65: Location of Repositioned Surrey Quays Station Entrance



Externally, this results in the entrance being located 60m closer to the OA, but 140m further from the Southwest; internally, the entrance is 30m closer to the Southbound platform, but 70m further from the Northbound (owing to the walkway across the line). These are actual distances which have been changed, not accounting for variable factors such as road-crossings and quality of pedestrian walkways which would affect time savings. The net changes are shown in **Figure 66**.

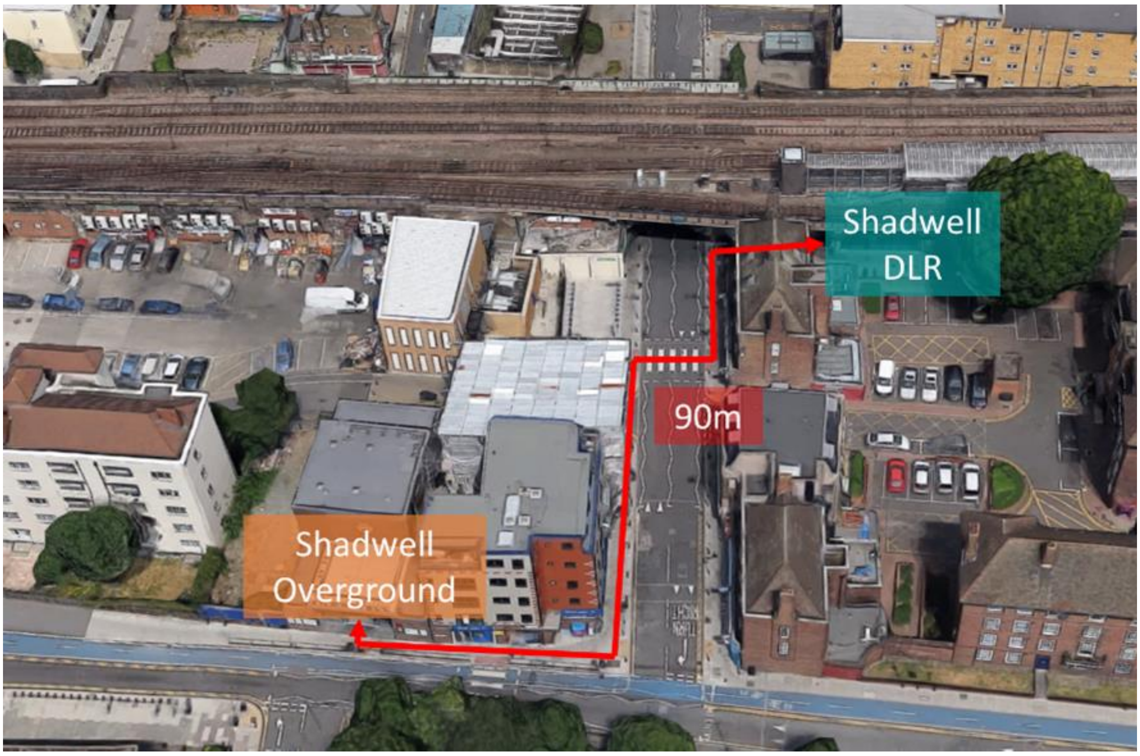
Figure 66: Summary of Walk Distances Resulting from Repositioned Surrey Quays Station Entrance



10.1.1.3 Test 7

Test 7 aims to improve and promote interchange between London Overground and DLR at Shadwell, to encourage rerouting via DLR to destinations in central London. In reality the two stations are currently separate; in Railplan, it is modelled as one station with interchange lengths of 230m between Overground and DLR platforms. The proposals our test based on is to make Shadwell a "fully integrated station" by shifting the DLR platforms thus removing the on-street part of the interchange (it is noted that this is the most intensive option for this scenario and the feasibility is unknown), with the aim of promoting Overground interchange at Shadwell to DLR instead of at Canada Water to the Jubilee Line. **Figure 67** shows that, in the best-case scenario, this on-street length is 90m (this distance would be lower if the back entrance of Shadwell Overground station was used, for instance), therefore the interchange lengths of 140m have been tested.

Figure 67: Shadwell Interchange



10.1.1.4 Test 8

Test 8 involves adding new calling points to Sydenham Line Thameslink services through the central London core. The aim of this test is to offer direct competition to London Overground at stations along the East London Line, and offer a new opportunity for users of this line to directly access central London stations and interchange opportunities.

Table 28 shows the stations along the route which are affected, with an additional 4tph between Sydenham and New Cross Gate.

Table 28: Summary of Revised Thameslink Stopping Pattern

Station	Northbound TPH Medium Development	Northbound TPH Thameslink Mitigation
Norwood Junction		No Change (already stop)
Anerley		No Change (non stop)
Penge West		No Change (non stop)
Sydenham	12tph	16tph
Forest Hill	12tph	16tph
Honor Oak Park	12tph	16tph
Brockley	12tph	16tph
New Cross Gate	12tph	16tph

The Bakerloo Line Extension (to Lewisham) and Crossrail 2 are major infrastructure schemes that have not been tested using the Canada Water model, but outputs from their respective modelling studies have been analysed to understand any impacts on Canada Water.

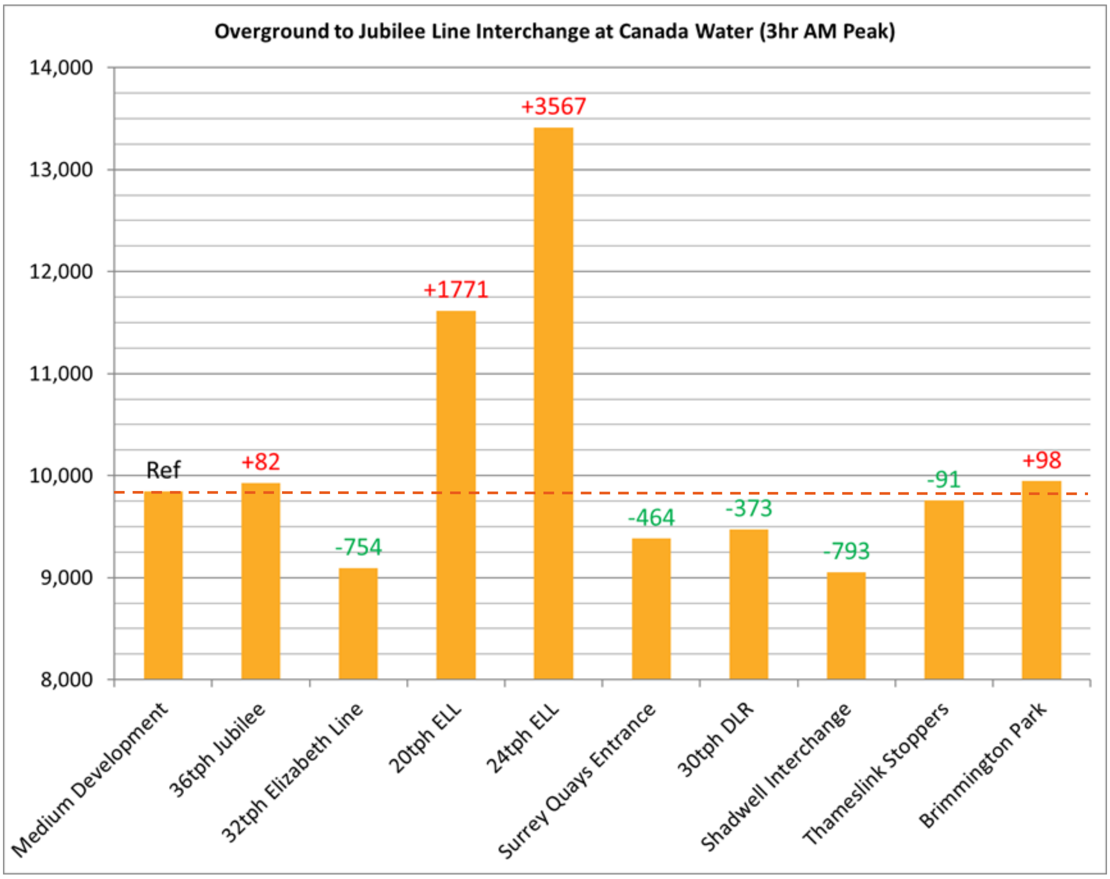
10.1.2 Summary of impacts

The nine mitigation scenarios have been compared against the Medium Development scenario across three key metrics which relate to the network stress areas identified in the core scenarios:

1. 3hr AM peak period public transport passenger flows
2. 3hr AM peak period station movements at Canada Water
3. 1hr AM peak hour crowding (standing passengers per square metre (pax/sqm))

Figure 68 shows the 3-hour AM peak number of interchange movements at Canada Water station from Overground to Jubilee Line (both directions) – the majority of these movements are from Northbound Overground services, and less so from Southbound:

Figure 68: Interchange Movements at Canada Water Station



Key observations include:

- The interchange improvement at Shadwell is intended to increase the attractiveness of using DLR to reach Canary Wharf as opposed to using the Jubilee Line. This desired impact is realised, particularly capturing a significant amount of the southbound East London Line trips. The impact of this test is the highest seen across the nine mitigation options.
- Elizabeth Line frequency increases significantly alleviate station movements at Canada Water as both northbound and southbound passengers can interchange at Whitechapel to get to Canary Wharf.
- Increasing DLR frequency attracts passengers away from using the Jubilee Line in both directions, resulting in a reasonable reduction in interchange movements at Canada Water.

- Moving Surrey Quays station entrance has a notable impact, though it should be noted that this is predominantly due to a change from using Surrey Quays to travel one stop to Canada Water then interchanging, to using local buses to access Canada Water initially. Hence the reduction in interchange is replaced with an increase in station entrance to Jubilee Line flows.
- Increasing Overground frequency significantly increases station movements at Canada Water, with approximately an 18% and 36% increase for 20tph and 24tph respectively as higher numbers of trips are encouraged to use the East London Line. Therefore increasing ELL frequency would not relieve Jubilee Line movements at Canada Water in isolation, so would need to be part of a wider package of intervention measures.
- The net effect of the Thameslink stopping pattern revision is a small decrease in interchange. This is a result of a decrease in westbound interchange as passengers along the Sydenham corridor now have access to alternative routes and interchange options in Central London, countered to a large degree by an increase in eastbound interchange as Thameslink passengers now have the option of interchanging onto the East London Line – predominantly at New Cross Gate - and accessing Canary Wharf via Canada Water (instead of travelling into a Central London terminus).

In summary, frequency increases on key competing services and the improved facilitation of east<>west interchange at Shadwell are the most beneficial schemes to addressing the issue of volume of movements through Canada Water station and therefor should be considered in the final proposed mitigation package.

Figure 69 and **Figure 70** show the 1 hour AM peak number of passengers standing per square metre on Westbound and Eastbound Jubilee Line services from Canada Water respectively.

Figure 69: Jubilee Line Standing Passengers Per Square Metre, Westbound from Canada Water

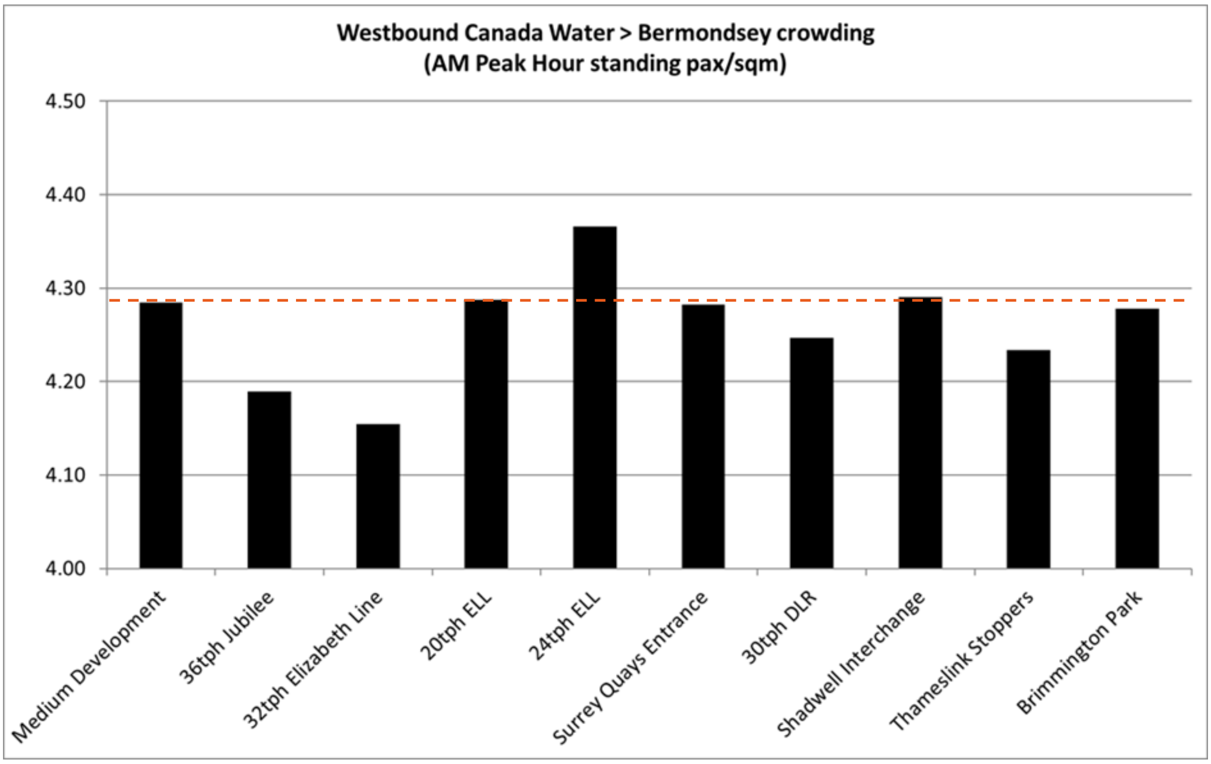
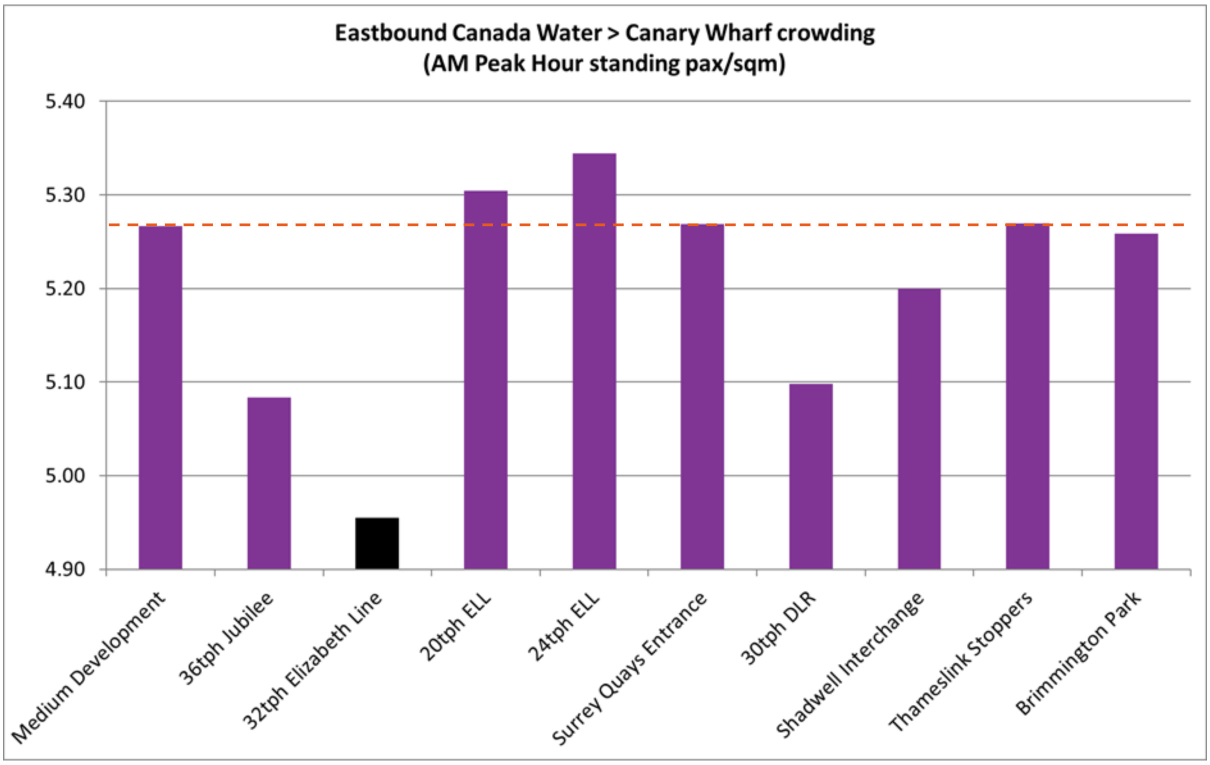


Figure 70: Jubilee Line Standing Passengers Per Square Metre, Eastbound from Canada Water



Key observations and wider impacts include:

- Crowded conditions in both directions from Canada Water are high, with eastbound being higher than westbound by between 0.5 and 1 passengers standing per square metre.
- The Elizabeth Line frequency increase has a large capacity improvement (approx. +18,000/hour through core section), and combined with improved connectivity to Canary Wharf with an additional 4tph, results in the most significant crowding alleviation on the Jubilee Line of all tests. The capacity is not entirely backfilled, and so crowding on the Elizabeth Line itself also reduces. This is the only test which results in peak hour capacity becoming available to boarders (in the Medium Development scenario, line loads are in excess of total capacity). This test also has far-reaching wider impacts, with alleviation seen on the Central, Piccadilly, TfL Rail and DLR lines.
- Increasing Jubilee Line frequency adds approximately 2,000 (5%) extra capacity per hour, but the increased flow through Canada Water is 1,500. Therefore, there is minimal improvement in crowding through Canada Water of around 0.1-0.2 pax/sqm, since the additional capacity is mostly backfilled by demand further down the line (alleviation occurs on Elizabeth, Metropolitan and DLR lines).
- Improving the Shadwell interchange alleviates Eastbound Crowding towards Canary Wharf by a small degree as passengers opt for the DLR over the Jubilee Line, despite the lower frequency and capacity.
- Increasing DLR frequency to 30tph further improves the crowding alleviation, but the impacts of these tests are mostly constrained to the DLR, with significant reductions in crowding levels seen into and out of Lewisham.
- Increasing the frequency of the Overground notably worsens crowding on the Jubilee Line as the volume of passengers arriving at Canada Water from Overground services increases significantly. Overall crowding on East London Line itself is slightly reduced as the additional

capacity is not wholly backfilled. The Clapham Junction branch does see increased crowding levels, but these are still low in absolute terms.

- As described previously, the Thameslink stopping pattern revision alleviates movements from Overground to Jubilee Line westbound, hence reduces crowding slighting, but has a broadly neutral effect on eastbound Jubilee Line as passengers ultimately still end up on this service but have boarded at Canada Water instead of a Central London station.
- As expected, moving Surrey Quays station entrance does not impact Jubilee Line crowding.

In summary, as with the issue surrounding the volumes of interchange at Canada Water, frequency increases on competing services and improving interchange at Shadwell generate the greatest improvements in crowding on Canada Water services. Despite worsening crowding, the enhancement to ELL services should not be dismissed as it represents a significant improvement to wider network connectivity.

10.1.3 Consideration of other major rail schemes

The Bakerloo Line Extension does have a significant effect on Canada Water. The scheme offers a new and attractive interchange option for East London Line passengers into Central London at New Cross Gate. Analysis of existing modelling shows a reduction in East London Line to Jubilee Line westbound interchange at Canada Water of nearly 50%. Whilst the crowding impacts have not been quantified, we would expect the reduction in westbound standing passengers on Jubilee Line to match that of the highest impacts illustrated above.

Crossrail 2 also has a notable effect on Canada Water, though on Jubilee Line flows and crowding, as opposed to station interchange. The Crossrail 2 route offers passengers from the south west, who previously would have travelled into Waterloo and interchanged onto the Jubilee Line to reach Canary Wharf, a new route option with direct access to Tottenham Court Road and the Elizabeth Line. The impact at Canada Water is a reduction in flow of around 1,500 passengers in the 3hr AM peak period (-2%) which is small in relation to wider impacts of Crossrail 2, but would deliver an impact on crowding similar (though less significant) to that seen in the Elizabeth Line frequency increase test.

10.2 Bus interventions

A bus strategy has been devised by TfL Buses to meet the increased demand resulting from the Canada Water development site and to focus bus provision to the new high street. The strategy is based on the Southeast Riverside Area Review[12] and also seeks to address wider connectivity issues in LB Southwark and surrounding key areas. A summary of changes in the Bus "Main" Test is given in the following table:

Table 29: Bus Main Test – Summary of changes

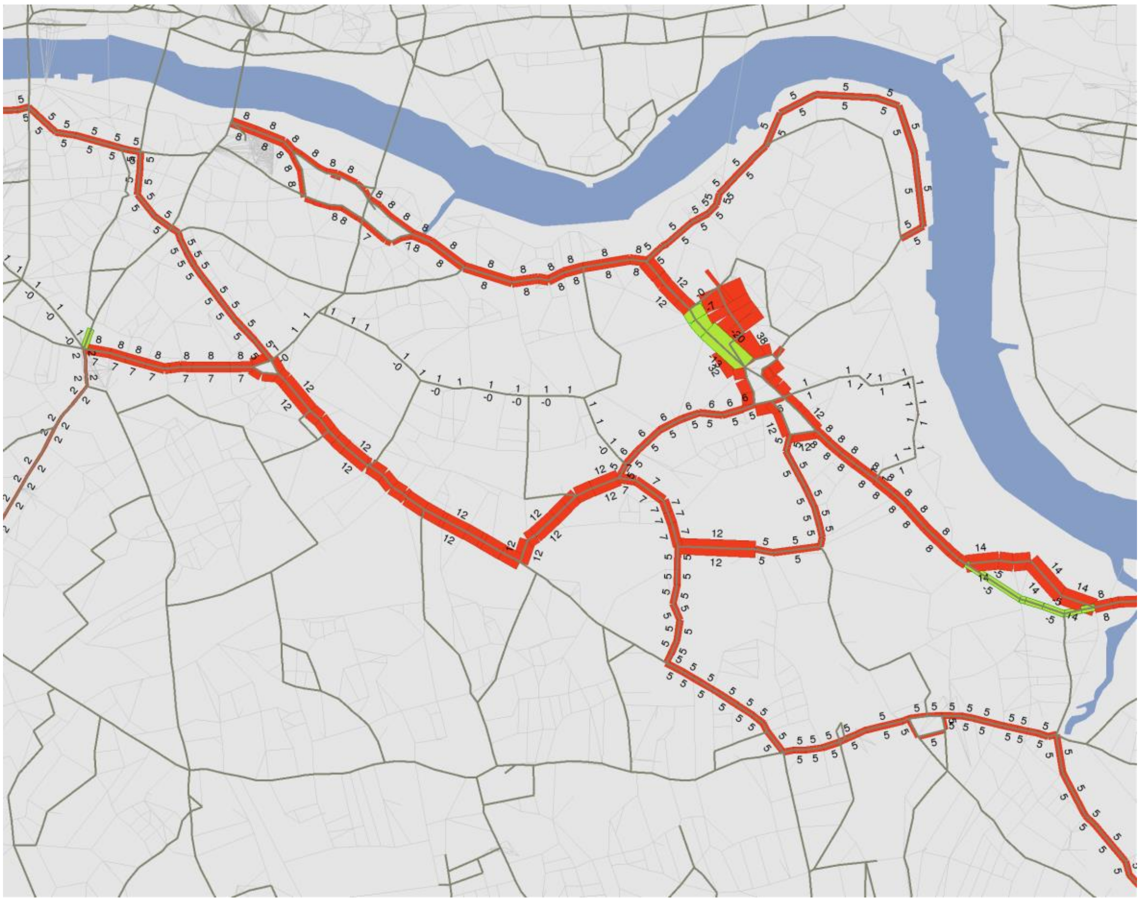
Route	Railplan Transit Line	Headway changes	Routing Changes
1	0001ia	Changed from 7.21 to 6.66	Rerouted via High Street
1	0001ka	Removed	Removed
188	0188ia	None	Curtailed at Waterloo
199	0199ia	Changed from 11.53 to 10	Rerouted via High Street and Convoys Wharf
225	0225ia	None	Rerouted via High Street
381	0381ia	Changed from 10.43 to 10	As per SE Riverside Bus Strategy
381	0381ja	Removed	Removed
415	0415ia	Changed from 11.53 to 8	Extended from E&C to Surrey Canal Road

[12] southeast-riverside-area-review.pdf

Route	Railplan Transit Line	Headway changes	Routing Changes
C10	0C10ia	Changed from 9.61 to 7.5	None
P12	0P12ia	None	Rerouted via High Street
Route A	RouteA	New route - 12.00	As per SE Riverside Bus Strategy
Route B	RouteB	New route - 12.00	As per SE Riverside Bus Strategy
Route C	RouteC	New route - 8.00	As per SE Riverside Bus Strategy

These changes are also shown in **Figure 71** in the form of a buses per hour difference plot compared to the Medium Development scenario.

Figure 71: Change in Buses Per Hour in the Main Bus Strategy vs Medium Development scenario



Source: Railplan test CQ612A312

10.2.1 Summary of impacts

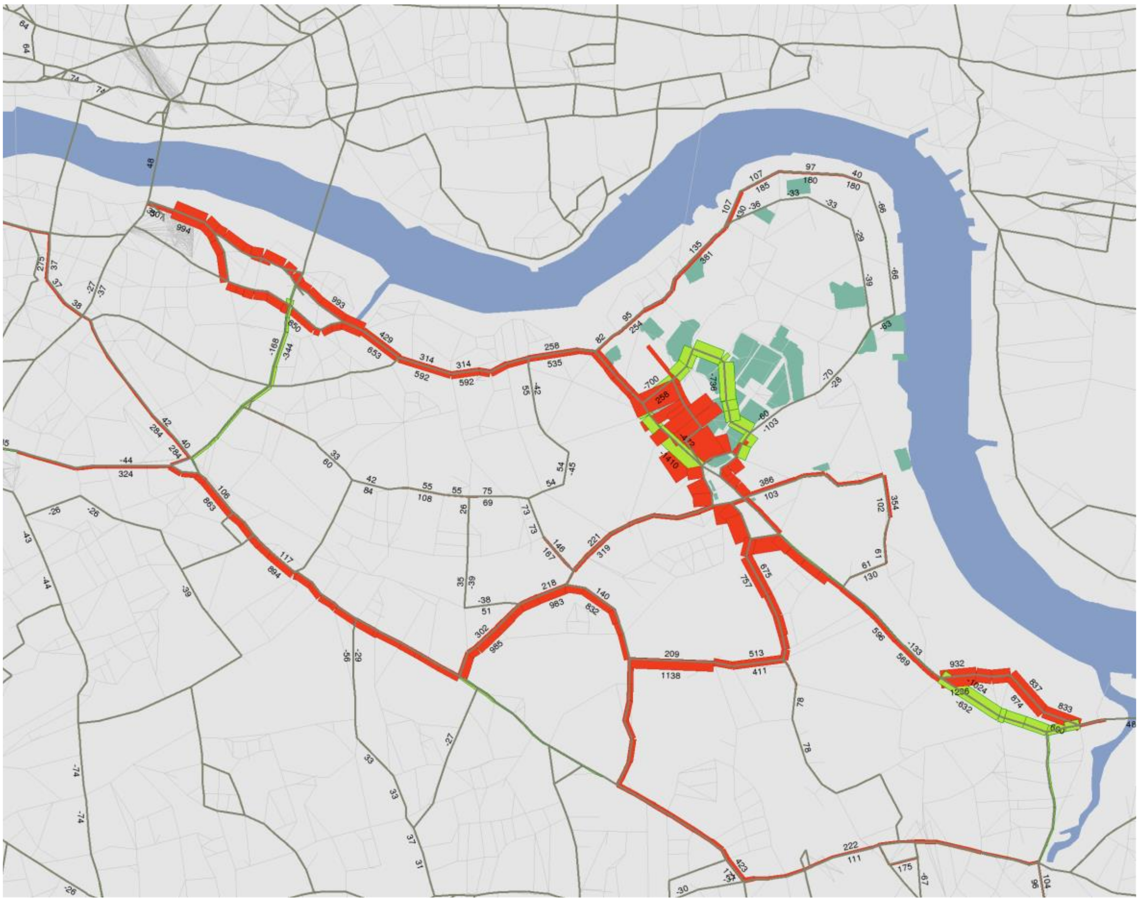
Bus boarding and alighting activity on the peninsula increases significantly with the introduction of the Main bus strategy. Boarders increase by approximately 65% (4,700 over 3 hour AM peak period) and alighters increase by approximately 69% (5,600). There is a small amount of abstraction from rail, with boards and alights at rail stations decreasing by approximately 2% (600) each.

Bus flows in the area subsequently increase notably too, highlighted below and in in Figre;

- Some significant percentage increases in bus use, though these should be used cautiously as in some cases the flows on links in the Medium scenario are low.
- The A200 corridor from Canada Water towards London Bridge increases by over 500 passengers, and in reverse by over 250.
- Increases in access to Canada Water to/from the southern access to the peninsula (A200 towards Greenwich, A2 Old Kent Road / New Cross Road and routes between these two corridors.

- Total Southern access to the OA increases by over 2,300, and from the OA increases by over 1,200.

Figure 72: Impact of Main Bus Strategy on Bus Flows Compared to Medium scenario



Source: Railplan test CQ612A312

The increase in bus usage is enough to increase the bus PT sub-mode share from 10% to 13% for trips to the OA. Trips from the OA remain unchanged at 7%.

10.3 No Tube Upgrade Tests

Following the initial tranche of mitigation testing, TfL announced[13] that funding for additional Jubilee and Northern line rolling stock was to be put on hold indefinitely, and therefore the proposed frequency upgrades on these lines due to occur by 2021 would no longer be happening. Consequently, any subsequent 2031 forecasting, including the development scenarios and packages of mitigation tests, has been undertaken using 2015 "No Tube Upgrade" (NTU) services for the Northern and Jubilee lines.

It should be noted that the individual testing of public transport interventions is still considered valid, despite including the upgraded tube network. All tests have consistent assumptions and therefore the results and merits relative to one another are reliable, which is the key consideration in defining a package of mitigations schemes.

[13] http://www.cityam.com/275381/tfl-says-major-tube-upgrades-northern-line-and-jubilee-line

This section summarises the changes in Northern and Jubilee line services between the 2031 AM development scenarios (Do-Minimum = CQ507 and Medium = CQ508) in comparison with the NTU scenarios (Do-Minimum = CQ515 and Medium = CQ516), and outlines the effects of these changes.

The following tables show the change in frequency between the Reference Case and NTU Jubilee and Northern line specifications:

Table 30: Change in frequency, Reference Case vs NTU – Jubilee Line

Reference Case Service	Frequency (TPH)	NTU Service	Frequency (TPH)
Stratford to Stanmore	11.49	Stratford to Stanmore	16.00
Stratford to Wembley Park	5.70	Stratford to Wembley Park	5.33
Stratford to Willesden Green	5.70	Stratford to Willesden Green	4.27
Stratford to West Hampstead	5.70	North Greenwich to Willesden Green	1.07
Stanmore to North Greenwich	5.70	North Greenwich to West Hampstead	5.33
Northbound Total	**34.29**	**Northbound Total**	**32.00**
Stanmore to Stratford	11.49	Stanmore to Stratford	16.00
Wembley Park to Stratford	5.70	Wembley Park to Stratford	5.33
Willesden Green to Stratford	5.70	Willesden Green to Stratford	4.27
West Hampstead to Stratford	5.70	Willesden Green to North Greenwich	1.07
North Greenwich to Stanmore	5.70	West Hampstead to North Greenwich	5.33
Southbound Total	**34.29**	**Southbound Total**	**32.00**

Table 31: Change in frequency, Reference Case vs NTU – Northern Line (via Bank)

Reference Case Service	Frequency (TPH)	NTU Service	Frequency (TPH)
Morden to Mill Hill East	5.00	Morden to Edgware	20.00
Morden to East Finchley	7.00	Morden to Golders Green	2.00
Morden to High Barnet	20.98	Morden to High Barnet	1.00
Northbound Total	**32.98**	**Northbound Total**	**23.00**
Edgware to Morden	15.00	Edgware to Morden	10.00
Mill Hill East to Morden	2.00	Mill Hill East to Morden	1.00
East Finchley to Morden	7.00	High Barnet to Morden	10.00
High Barnet to Morden	9.00		
Southbound Total	**33.00**	**Southbound Total**	**21.00**

Table 32: Change in frequency, Reference Case vs NTU – Northern Line (via Charing Cross)

Reference Case Service	Frequency (TPH)	NTU Service	Frequency (TPH)
Battersea to Edgware	20.00	Battersea to Mill Hill East	5.00
Battersea to Colindale	5.00	Battersea to High Barnet	12.99

Reference Case Service	Frequency (TPH)	NTU Service	Frequency (TPH)
Battersea to Golders Green	5.00	Morden to High Barnet	4.00
Northbound Total	**30.00**	**Northbound Total**	**21.99**
Edgware to Battersea	5.00	Edgware to Battersea	6.00
Colindale to Battersea	5.00	Edgware to Morden	5.00
Golders Green to Battersea	5.00	Mill Hill East to Battersea	4.00
Mill Hill East to Battersea	3.00	High Barnet to Battersea	7.00
High Barnet to Battersea	12.00		
Southbound Total	**30.00**	**Southbound Total**	**22.00**

The Northern line suffers a large decrease of 63tph to 44tph; however, of more relevance to the Canada Water study is the decrease from 34tph to 32tph on the Jubilee line. This is particularly an issue on Eastbound travel through Canada Water which is already highly crowded in the reference case.

10.3.1 Summary of impacts

The following tables show the change in movements at key stations.

10.3.1.1 Do-Minimum

Figure 73: Absolute change in passenger movements at Canada Water, Do-Minimum NTU (CQ515) vs Development (CQ507)

CANADA WATER	360301 Canada Water Main SE [1]	360318 Canada Water Overground (NB)	360319 Canada Water Overground (SB)	360322 Canada Water Jubilee (WB)	360323 Canada Water Jubilee (EB)	TOTAL
Canada Water Main SE [1]	0	92	3	-112	-83	-100
Canada Water Overground (NB)	-2	0	0	-241	220	-23
Canada Water Overground (SB)	83	0	0	-107	13	-11
Canada Water Jubilee (WB)	-75	-7	-89	0	0	-171
Canada Water Jubilee (EB)	-162	-17	-16	0	0	-195
TOTAL	-156	68	-102	-460	150	-500

Figure 74: Percentage change in passenger movements at Canada Water, Do-Minimum NTU (CQ515) vs Development (CQ507)

CANADA WATER	360301 Canada Water Main SE [1]	360318 Canada Water Overground (NB)	360319 Canada Water Overground (SB)	360322 Canada Water Jubilee (WB)	360323 Canada Water Jubilee (EB)	TOTAL
Canada Water Main SE [1]	0.0%	11.6%	4.6%	-1.9%	-4.6%	-1.2%
Canada Water Overground (NB)	-2.9%	0.0%	0.0%	-5.2%	6.7%	-0.3%
Canada Water Overground (SB)	20.9%	0.0%	0.0%	-9.7%	1.0%	-0.4%
Canada Water Jubilee (WB)	-3.9%	-0.8%	-11.9%	0.0%	0.0%	-4.9%
Canada Water Jubilee (EB)	-10.2%	-3.0%	-5.2%	0.0%	0.0%	-7.9%
TOTAL	-3.9%	3.1%	-9.1%	-4.0%	2.4%	-2.0%

Figure 75: Absolute change in passenger movements at Surrey Quays, Do-Minimum NTU (CQ515) vs Development (CQ507)

SURREY QUAYS	360401 Station Ent.1	360418 Overground NB	360419 Overground SB	TOTAL
Station Ent.1	0	17	11	28
Overground NB	24	0	0	24
Overground SB	41	0	0	41
TOTAL	65	17	11	93

Figure 76: Percentage change in passenger movements at Surrey Quays, Do-Minimum NTU (CQ515) vs Development (CQ507)

SURREY QUAYS	360401 Station Ent.1	360418 Overground NB	360419 Overground SB	TOTAL
Station Ent.1	0.0%	0.3%	1.4%	0.5%
Overground NB	3.5%	0.0%	0.0%	3.5%
Overground SB	4.0%	0.0%	0.0%	4.0%
TOTAL	3.8%	0.3%	1.4%	1.2%

Figure 77: Absolute change in passenger movements at Rotherhithe, Do-Minimum NTU (CQ515) vs Development (CQ507)

ROTHERHITHE	360201 Rotherhithe Main SE [1]	360218 Rotherhithe Overground (NB)	360219 Rotherhithe Overground (SB)	TOTAL
Rotherhithe Main SE [1]	0	48	-16	32
Rotherhithe Overground (NB)	-1	0	0	-1
Rotherhithe Overground (SB)	35	0	0	35
TOTAL	34	48	-16	66

Figure 78: Percentage change in passenger movements at Rotherhithe, Do-Minimum NTU (CQ515) vs Development (CQ507)

ROTHERHITHE	360201 Rotherhithe Main SE [1]	360218 Rotherhithe Overground (NB)	360219 Rotherhithe Overground (SB)	TOTAL
Rotherhithe Main SE [1]	0.0%	4.9%	-4.6%	2.4%
Rotherhithe Overground (NB)	-0.5%	0.0%	0.0%	-0.5%
Rotherhithe Overground (SB)	6.0%	0.0%	0.0%	6.0%
TOTAL	4.3%	4.9%	-4.6%	3.1%

10.3.1.2 Medium

Figure 79: Absolute change in passenger movements at Canada Water, Medium NTU (CQ516) vs Development (CQ508)

CANADA WATER	360301 Canada Water Main SE [1]	360318 Canada Water Overground (NB)	360319 Canada Water Overground (SB)	360322 Canada Water Jubilee (WB)	360323 Canada Water Jubilee (EB)	TOTAL
Canada Water Main SE [1]	0	131	2	-156	-86	-109
Canada Water Overground (NB)	2	0	0	-215	229	16
Canada Water Overground (SB)	209	0	0	-117	0	92
Canada Water Jubilee (WB)	-182	-29	-99	0	0	-310
Canada Water Jubilee (EB)	-349	-21	-12	0	0	-382
TOTAL	-320	81	-109	-488	143	-693

Figure 80: Percentage change in passenger movements at Canada Water, Medium NTU (CQ516) vs Development (CQ508)

CANADA WATER	360301 Canada Water Main SE [1]	360318 Canada Water Overground (NB)	360319 Canada Water Overground (SB)	360322 Canada Water Jubilee (WB)	360323 Canada Water Jubilee (EB)	TOTAL
Canada Water Main SE [1]	0.0%	11.8%	3.5%	-2.0%	-3.9%	-1.0%
Canada Water Overground (NB)	3.1%	0.0%	0.0%	-4.9%	7.1%	0.2%
Canada Water Overground (SB)	34.3%	0.0%	0.0%	-11.7%	0.0%	3.2%
Canada Water Jubilee (WB)	-4.3%	-3.6%	-13.1%	0.0%	0.0%	-5.4%
Canada Water Jubilee (EB)	-7.7%	-3.8%	-4.1%	0.0%	0.0%	-7.1%
TOTAL	-3.4%	3.3%	-9.9%	-3.7%	2.1%	-2.1%

Figure 81: Absolute change in passenger movements at Surrey Quays, Medium NTU (CQ516) vs Development (CQ508)

SURREY QUAYS	360401	360418	360419	
	Station Ent.1	Overground NB	Overground SB	TOTAL
Station Ent.1	0	20	21	41
Overground NB	61	0	0	61
Overground SB	120	0	0	120
TOTAL	181	20	21	222

Figure 82: Percentage change in passenger movements at Surrey Quays, Medium NTU (CQ516) vs Development (CQ508)

SURREY QUAYS	360401	360418	360419	
	Station Ent.1	Overground NB	Overground SB	TOTAL
Station Ent.1	0.0%	0.4%	2.3%	0.7%
Overground NB	3.0%	0.0%	0.0%	3.0%
Overground SB	4.7%	0.0%	0.0%	4.7%
TOTAL	4.0%	0.4%	2.3%	2.1%

Figure 83: Absolute change in passenger movements at Rotherhithe, Medium NTU (CQ516) vs Development (CQ508)

ROTHERHITHE	360201	360218	360219	
	Rotherhithe Main SE [1]	Rotherhithe Overground (NB)	Rotherhithe Overground (SB)	TOTAL
Rotherhithe Main SE [1]	0	45	-16	29
Rotherhithe Overground (NB)	-1	0	0	-1
Rotherhithe Overground (SB)	30	0	0	30
TOTAL	29	45	-16	58

Figure 84: Percentage change in passenger movements at Rotherhithe, Medium NTU (CQ516) vs Development (CQ508)

ROTHERHITHE	360201	360218	360219	
	Rotherhithe Main SE [1]	Rotherhithe Overground (NB)	Rotherhithe Overground (SB)	TOTAL
Rotherhithe Main SE [1]	0.0%	4.4%	-4.9%	2.2%
Rotherhithe Overground (NB)	-0.5%	0.0%	0.0%	-0.5%
Rotherhithe Overground (SB)	5.1%	0.0%	0.0%	5.1%
TOTAL	3.6%	4.4%	-4.9%	2.7%

10.3.1.3 Conclusions

In both the Do-Minimum and Medium NTU scenarios, there is a decrease in passenger movements at Canada Water of approximately 2% as fewer passengers are using the Jubilee Line due to the lower frequency. On the other hand, movements increase by up to 3% at Surrey Quays and Rotherhithe as more passengers utilise the Overground as an alternative to the Jubilee and Northern lines.

Further to the results from Railplan, more detailed modelling has been undertaken by Mott MacDonald using Legion. Legion is able to account for station capacity, crowding and the frequency of services at detailed time intervals to create an accurate representation of ‘left-behinds’ (i.e. people unable to board a train due to crowding). Legion uses Railplan outputs to inform the strategic level of change in movements within in a station, though this data is processed alongside observed data to create a more accurate result.

11 Highway intervention testing

The areas of the highway network likely to come under stress following the introduction of medium growth development to the Canada Water area have been analysed as part of this study through analysis displayed in **Section 8** and **Section 9**. As displayed in the sections above, these areas include the Surrey Quays Road/Lower Road and Redriff Road/Lower Road junctions, and the Rotherhithe Tunnel roundabout. As a result of this, possible highway interventions have been agreed and tested in the highway model to relieve the stress generated by the development traffic. The tests are listed below with methodology and results displayed in this section:

- Low car mode share from the development traffic
- Various re-designs of Jamaica Road and Lower Road to incorporate the removal of the Lower Road gyratory and the possible introduction of Cycle Superhighway 4 (CS4)
- Rotherhithe Tunnel charged
  - With Silvertown Tunnel and with Rotherhithe Tunnel charged

11.1 Low Car Mode Share

The draft 'Mayor's Transport Strategy' has a London-wide target of 80% mode share for public transport, walking and cycling in London by 2041. The strategy expects planning frameworks in growth areas, such as Canada Water, to set mode share targets that are significantly more ambitious than the GLA-wide 80% average. A sensitivity test was therefore undertaken whereby the highway demand matrix was adjusted to reflect a target car mode share for all development related traffic.

11.1.1 Demand matrix adjustment

The do-minimum demand matrix was subtracted from the medium growth demand matrix to give all trips affected by Canada Water development. Upon first inspection of the resultant matrix, there were expected levels of demand growth to and from the peninsula but also some unexpected decreases in demand elsewhere in the matrix. It was therefore decided that reduction factors would only be applied to zones related to development demand i.e. those given in **Table 19**. These reductions in demand are likely to be attributable to the re-distribution of jobs and population and the subsequent demand response.

A reduction factor of 0.5 was agreed and applied only to car-based user classes; this resulted in the total number of origins and destinations given below in **Table 33** i.e. including taxi, LGV and OGV. **Table 33** also displays the medium growth trip ends for the development area zones, as displayed, for some zones, the low-car adjustment increases the total number of origin trips, this is due to the slight re-distribution of trips in the do-minimum scenario when compared to the medium growth; the total number of origins from the study area decreases by approximately 220 pcus/hr.

Table 33 reveals that some zones result in a minor increase in the number of trips to and from some zones. This is due to minor differences in the re-distribution of trip ends in the Canada Water area between the do-minimum and medium growth development demand scenarios. Demand is distributed proportionally according to homes and jobs in the area with these proportions changing slightly between the scenarios.

Table 33: Low Car peninsula trip ends

	Destinations		Origins	
New Zone	Medium growth	Low Car adjustment	Medium growth	Low Car adjustment
26274	14	14	6	11
26275	86	83	31	56
26276	43	42	14	26
26277	40	39	13	23
26278	32	31	11	20
26279	313	255	1087	829
26280	27	27	7	12
26281	111	108	20	36
26282	1	1	12	22
26283	42	41	17	32
26284	79	77	24	43
26285	114	111	9	16
26286	190	137	897	625
26287	26	25	12	22
26288	123	119	19	34
26289	73	71	22	40
26290	88	86	15	27
26291	39	38	13	23
26292	113	111	24	43
26293	44	43	6	10
26294	0	0	10	17
26295	37	36	24	44
26296	33	33	2	4
26297	66	64	11	20
26298	91	88	39	71
26299	111	108	26	47
Total	1,937	1,790	2,371	2,152

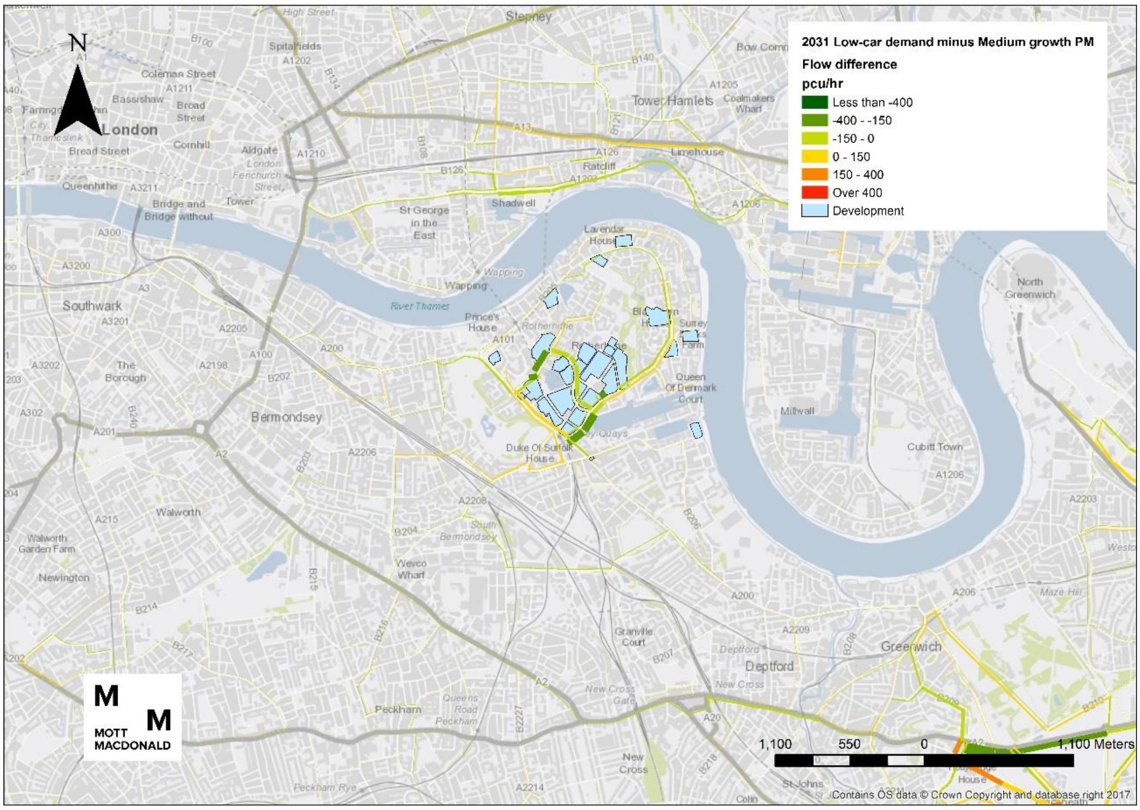
Source: C3_2679Z_A131CW07_LowCar_PM.CSV

The ‘low car’ demand matrices were assigned to the same networks used in the development scenarios above.

11.1.2 Results

Figure 85 below shows the difference between the low-car demand scenario compared with the medium growth scenario and therefore shows the locations on the network where stress would be relieved if the Mayor’s Transport Strategy targets are achieved.

Figure 85: Low-car demand minus Medium growth – Flow Difference



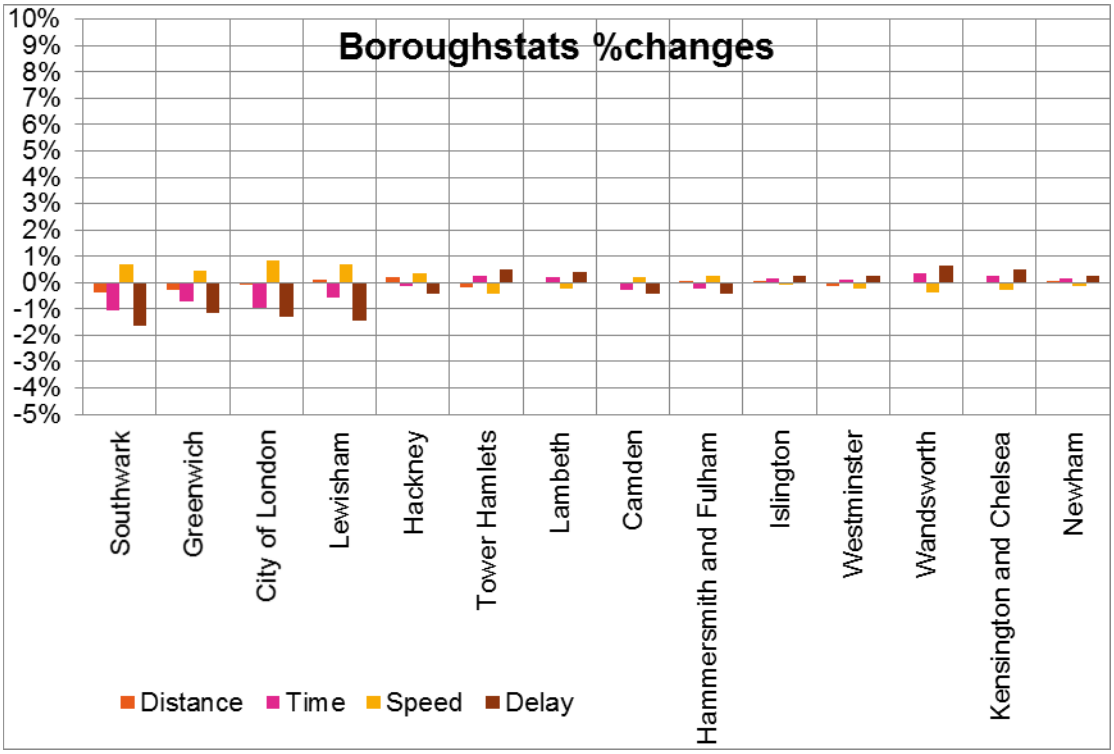
Source: Ordnance Survey data © Crown copyright and database right 2016

The plot above shows reductions in traffic around the major development plots along with reductions heading towards the Rotherhithe Tunnel. As development traffic decreases, Rotherhithe Tunnel traffic heading to and from the peninsula also decreases, however, this tunnel traffic is replaced by an increase in through traffic as seen on Lower Road between Redriff Road and Surrey Quays Road and thus the tunnel remains at capacity with no difference displayed above.

The changes in flow above result in very minor changes in delay with minor decreases on the northern arm of the Rotherhithe Tunnel roundabout (approx. 45 seconds per pcu) and minor increases at the southern arm (45 seconds per pcu) due to the minor switch in tunnel traffic from peninsula traffic to through traffic.

Figure 86 below shows the percentage change in distance, travel time, average speed and delay experienced when comparing the low-car demand scenario with the Medium growth development scenario.

Figure 86: 2031 Medium growth Low-car demand compared with Medium growth – Borough Statistics



Source: HAM_BoroStats_3.8 - CW_Med_LowCar.xlsm

The plot above shows minor decreases in delay and travel time and subsequent increases in average speed in Southwark, Greenwich, City of London and Lewisham if a 50% reduction in expected car-based development traffic is achieved.

11.2 Cycle Superhighway 4 re-designs (Fixed demand tests)

TfL and LBS provided Mott MacDonald with 4 design options for Jamaica Road, Lower Road and the A200 corridor into Greenwich and Lewisham. The re-designs for each portion of the entire A200 corridor were undertaken by or on behalf of either TfL or LBS. It was decided to undertake 4 tests in order to incorporate LBS designs for Lower Road with and without cycle superhighway 4 in place. Each design uses the 'do-minimum' network used in the development scenarios as a starting point and will implement each design as an edit to this network.

Both the CS4 and Lower Road gyratory designs have not been finalised and are therefore subject to change.

The 4 combinations of corridor re-design were agreed as the following:

Table 34: CS4 design options

Option	Jamaica Road	Lower Road	Lewisham/Greenwich
1	TfL design	TfL design	TfL design
2	TfL design	LBS design with CS4	TfL design
3	Do nothing	LBS design without CS4	Do nothing
4	TfL design	LBS design without CS4	TfL design

Source: TfL/LBS

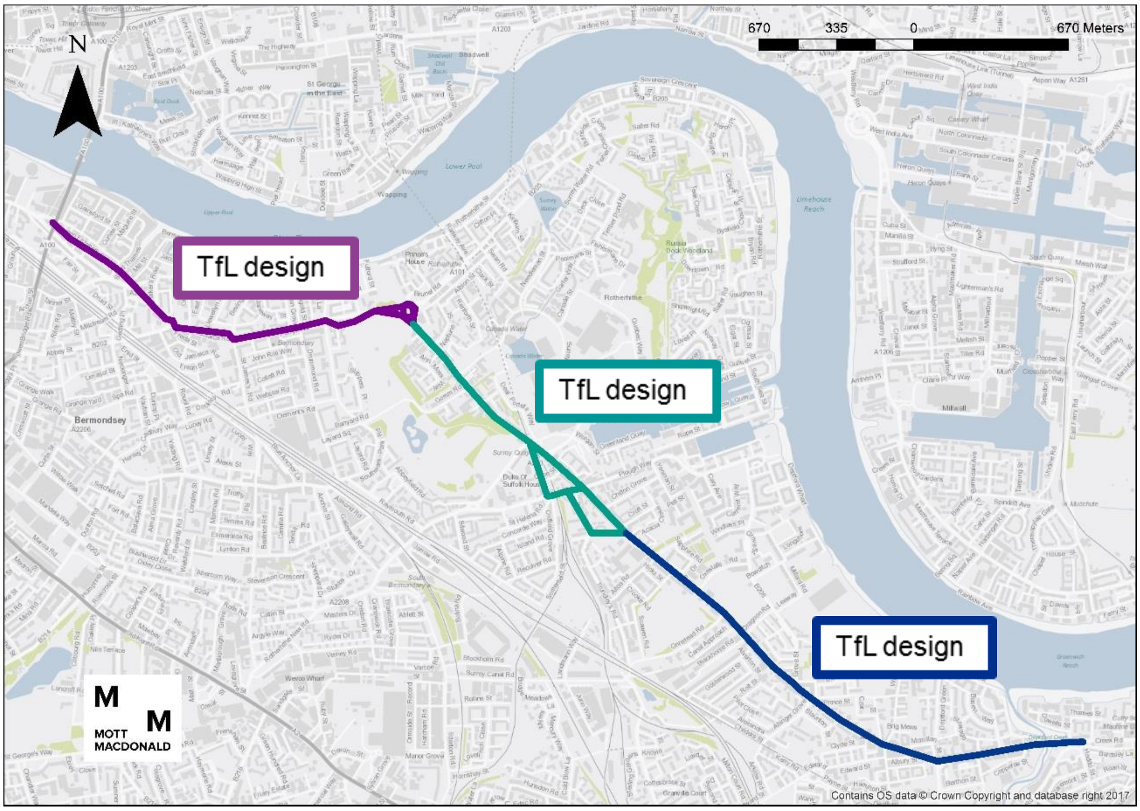
Each network option has been tested with the same ‘low-car medium growth’ demand matrix used in the development scenarios (**Section 11.1**). The ‘low-car’ demand was used as an approximation for the expected demand shift following the improvement to cycling provision in the area.

A primary area of focus for LBS on the Lower Road portion of the corridor is the policy to remove or re-structure the existing gyratory. It is therefore important that this is carefully considered when being included in each option along with the resultant impacts.

11.2.1 Option 1 – Full TfL design

Figure 87 below displays the coverage and extent of each design on the A200 corridor.

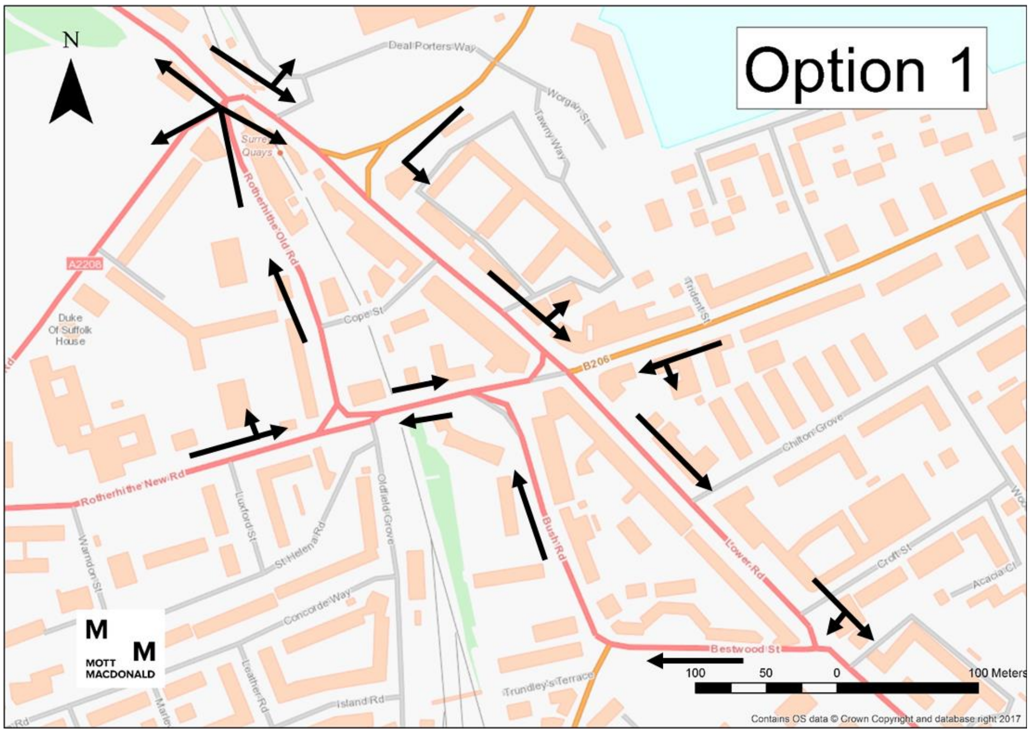
Figure 87: CS4 re-design - Option 1



Source: Ordnance Survey data © Crown copyright and database right 2016

As described above, the Lower Road gyratory is of high importance in each option. As option 1 is a TfL design, the policy to remove or re-structure the gyratory has not been included and the operation is similar to existing, with capacity reduced to make room for CS4. Option 1 gyratory operation can be seen in more detail in **Figure 88**.

Figure 88: Option 1 Lower Road gyratory operation

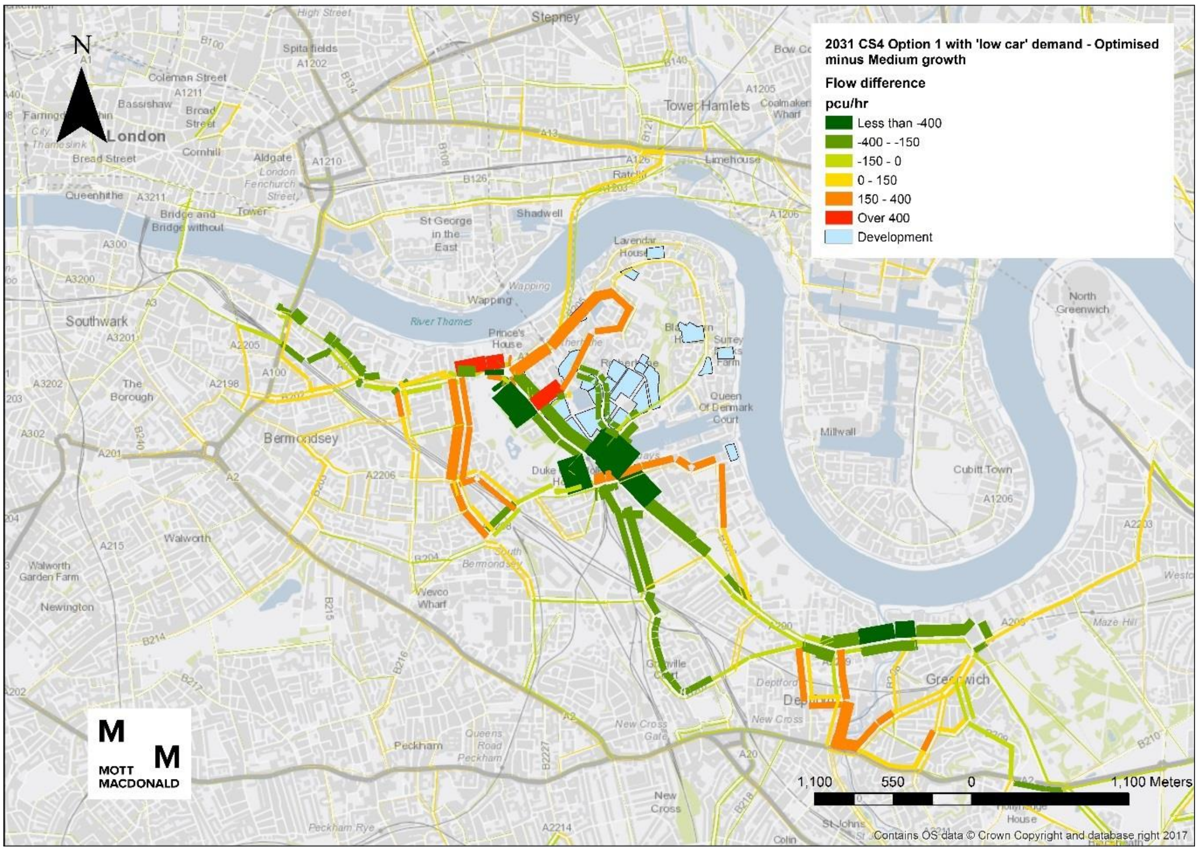


Source: Ordnance Survey data © Crown copyright and database right 2016

As displayed above, the same existing structure is retained. However, the junction between Lower Road and Redriff Road, heading southbound, has been reduced to two ahead lanes and one left lane on to Redriff Road. Also on Lower Road, heading southbound, at the junction with Plough Way, the left turn has been reduced to one lane plus a flare.

Figure 89 below shows the change in total traffic flow as a result of the re-design, along with the 'low-car' assumptions, as described above. This is done by comparing the option 1 design with the 'medium growth' development scenario.

Figure 89: 2031 flow difference between Option 1 with 'low car' demand and the medium growth scenario

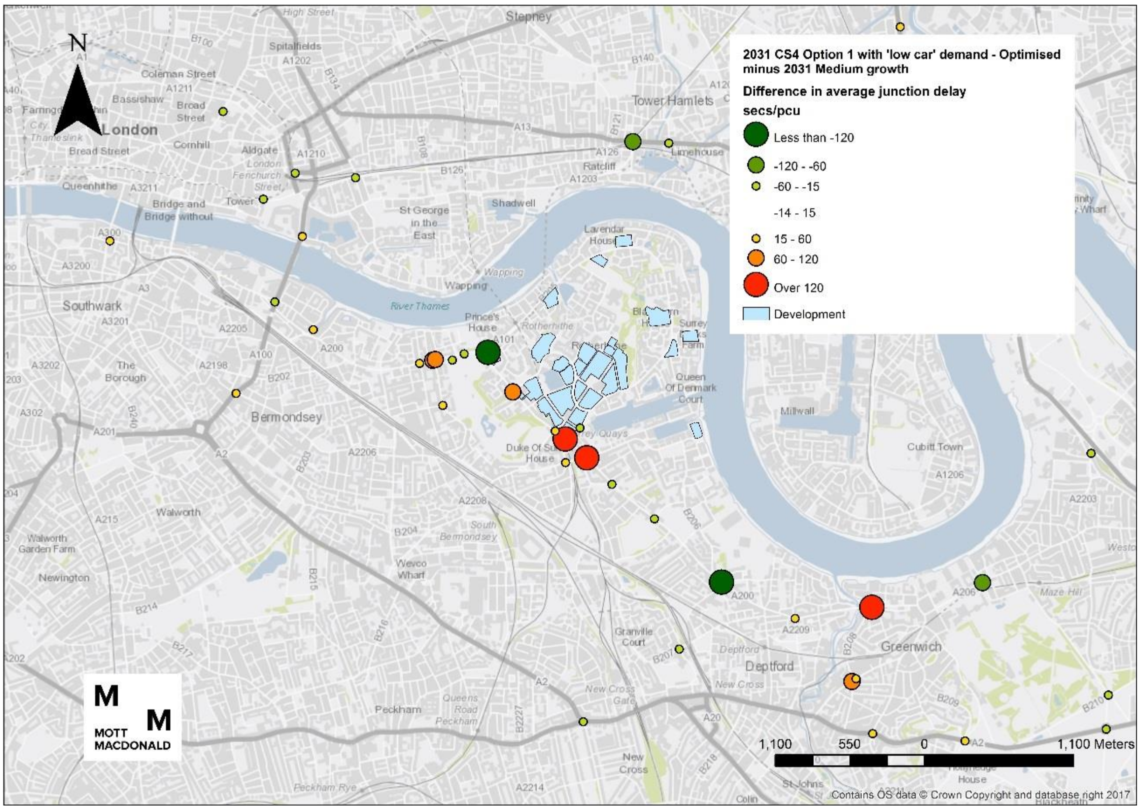


Source: Ordnance Survey data © Crown copyright and database right 2016

As displayed above, the large reductions in capacity on Jamaica Road, Lower Road and in to Lewisham and Greenwich as a result of road space re-allocation to CS4 results in large reductions in flow. Traffic is then displaced from the strategic network and re-routes on to Needleman Street, Salter Road, Southwark Park Road, Plough Way, Grove Street and other minor roads in Lewisham and Greenwich.

Figure 90 below shows the change in flow-weighted average junction delay using the same scenarios as above in **Figure 89**.

Figure 90: 2031 delay difference between Option 1 with 'low car' demand and the medium growth scenario

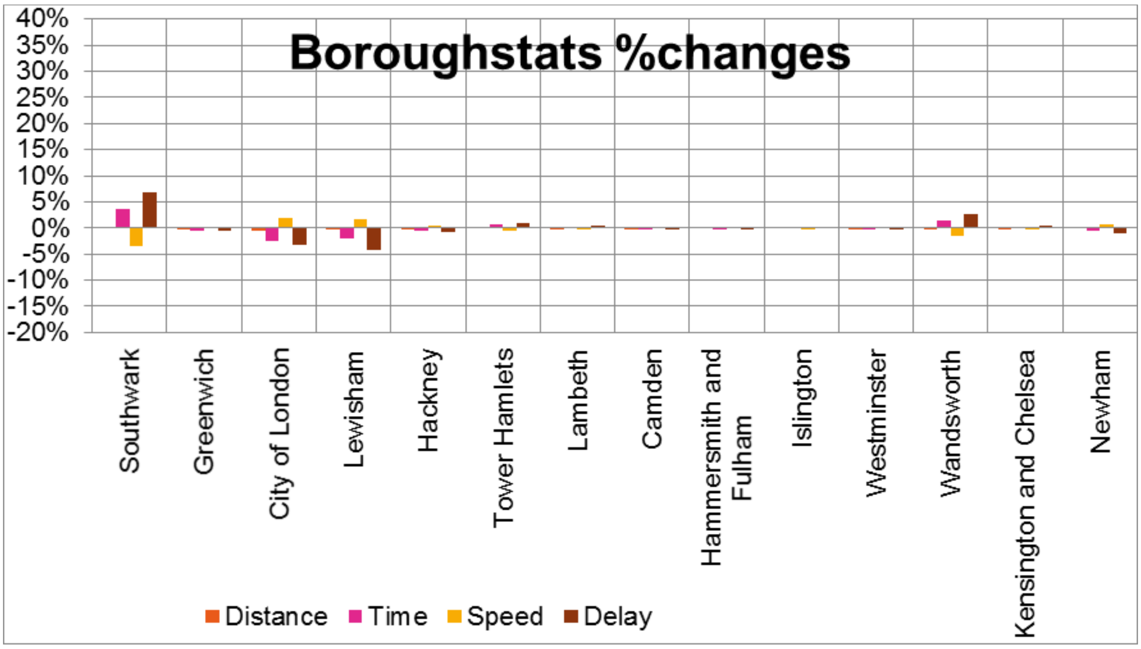


Source: Ordnance Survey data © Crown copyright and database right 2016

As displayed above, rat-running along Southwark Park Road has resulted in minor increases in delay at the junction with Jamaica Road. Opening the emergency lane access to the tunnel, heading northbound, has resulted in reduced delay there and also explains the increase in northbound flow in the tunnel, as seen in **Figure 89**. The reductions in capacity on the gyratory, as described above, have resulted in significantly increased delay here.

Figure 91 below gives a summary, for selected boroughs, of the percentage changes in overall delay, average speed, overall travel time and overall travel distance for option 1, using the same scenarios as seen in **Figure 89** and **Figure 90**. Full statistics can be seen in **Appendix B.6**.

Figure 91: Change in Borough statistics between Option 1 with 'low car' demand and the medium growth scenario



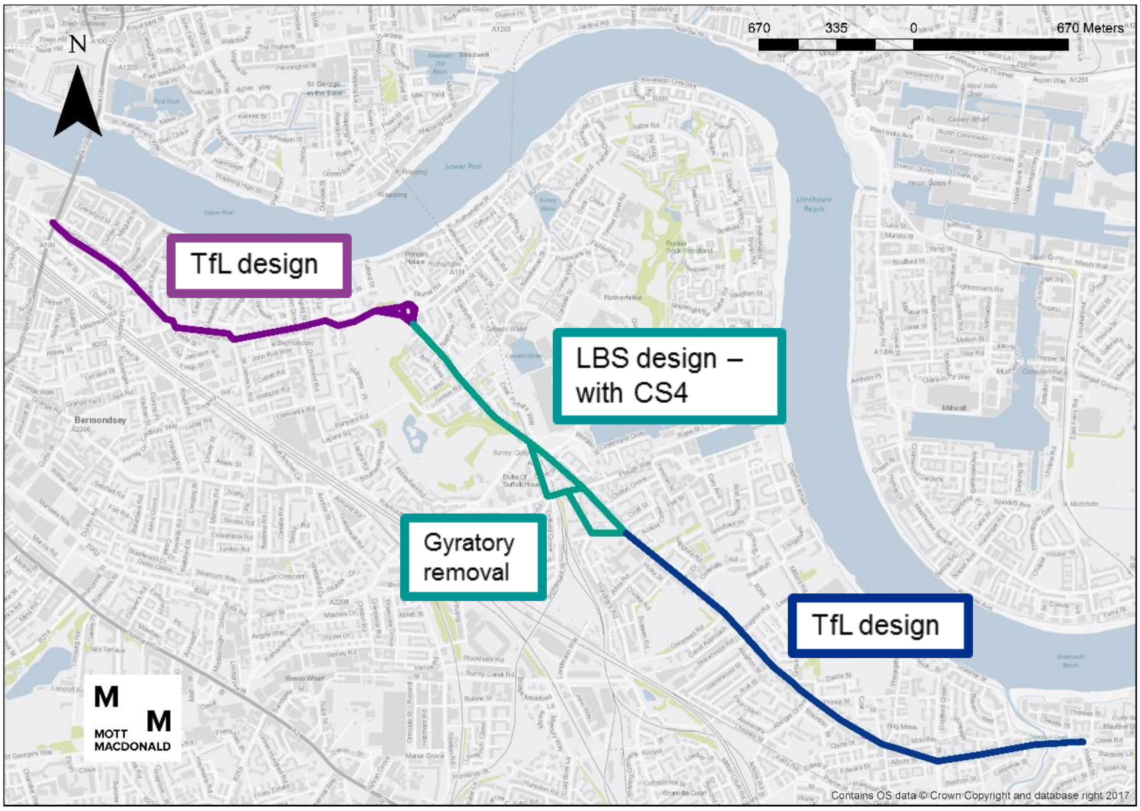
Source: HAM_BoroStats_3.8 - CW_Med_CS4Op1_lowcar_Optimised.xlsm

The moderate increases in delay in Southwark are due to reduced capacity on strategic routes i.e. Jamaica Road and Lower Road with more traffic using minor roads. The delays can be seen in more detail in **Figure 90**. The reduction of traffic on Evelyn Street, as seen in **Figure 89**, relieves delay heading southbound at the mini-roundabout with Abinger Grove and Prince Street and thus results in a net reduction in delay in Lewisham.

11.2.2 Option 2 – As per Option 1 with LBS Lower Road design with CS4

Figure 92 below displays the coverage and extent of each design on the A200 corridor.

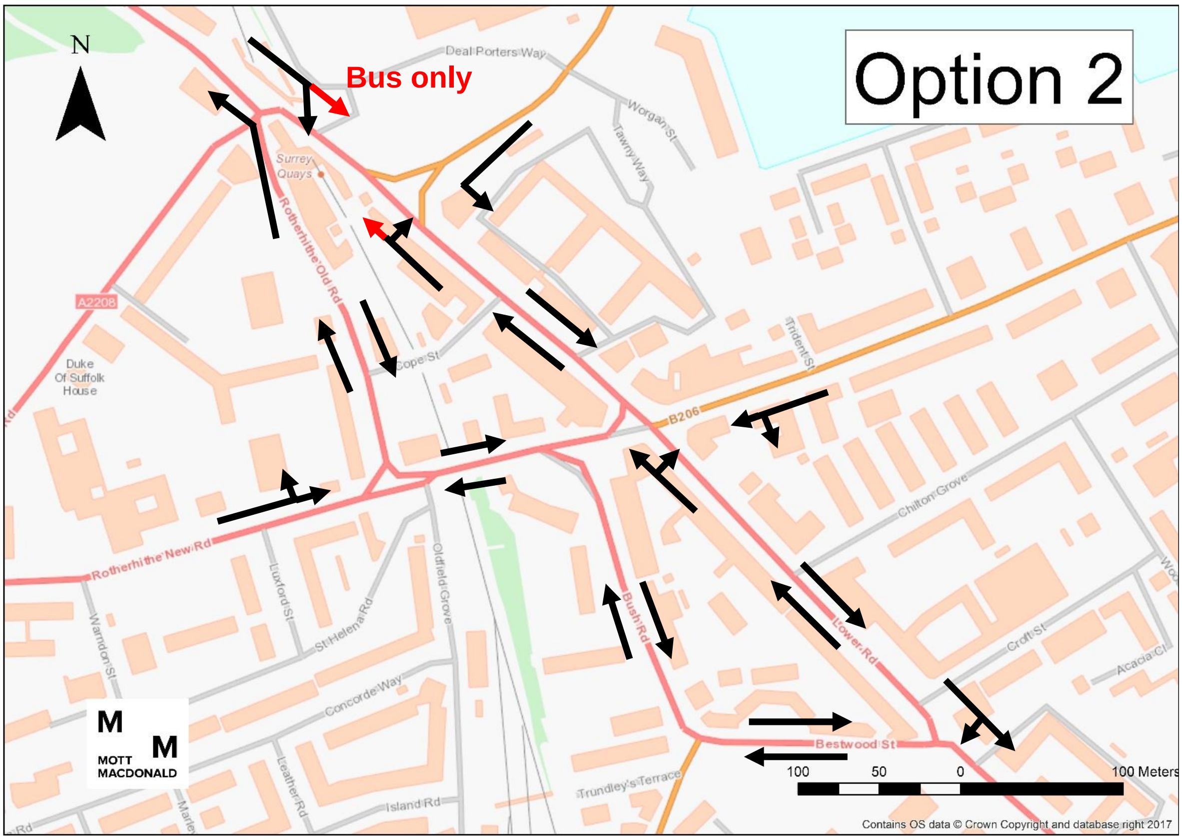
Figure 92: Option 2



Source: Ordnance Survey data © Crown copyright and database right 2016

CS4 Option 2 contains LB Southwark's design for Lower Road and includes the re-structuring of the Lower Road gyratory. **Figure 93** below shows the proposed operation of the Lower Road gyratory in option 2.

Figure 93: Option 2 Lower Road gyratory operation

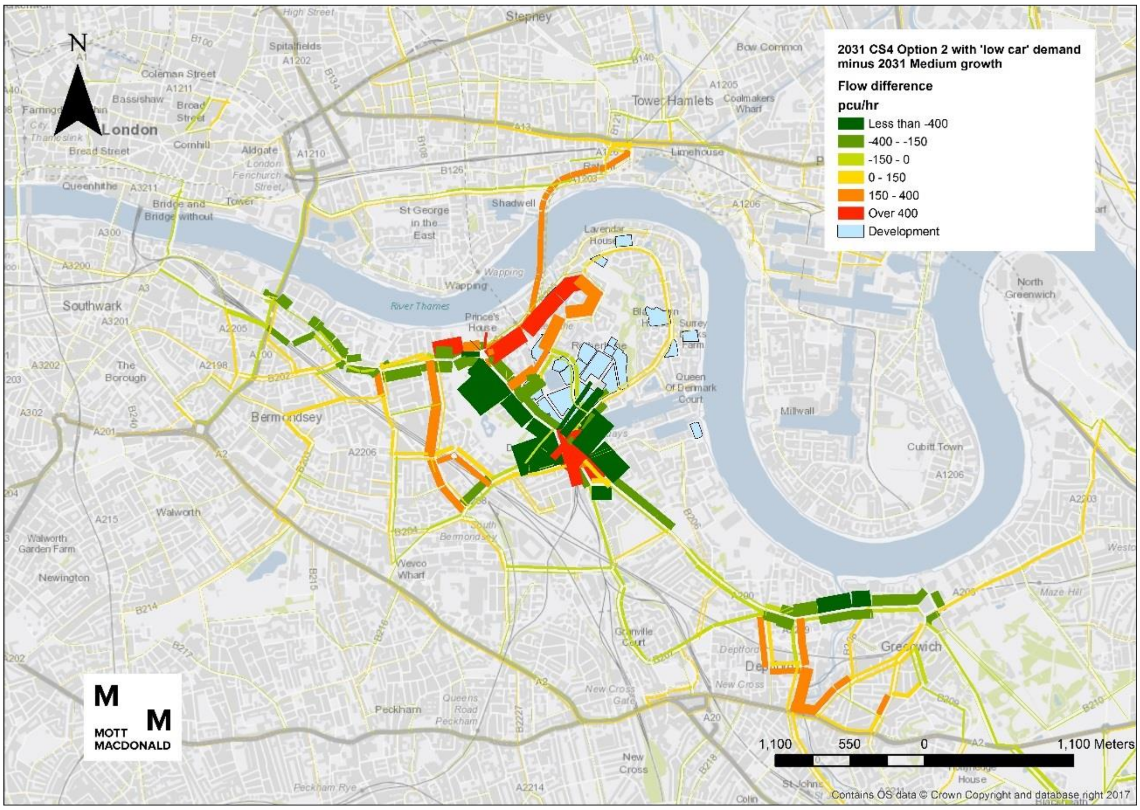


Source: Ordnance Survey data © Crown copyright and database right 2016

A 'bus gate' has been introduced at the north-western end of the gyratory and doesn't allow through traffic to stay on Lower Road. Instead, general traffic can use Rotherhithe Old Road, Bush Road and Bestwood Street in both directions. The right turn from Rotherhithe Old Road on to Lower Road is no longer allowed, northbound traffic must instead travel up Lower Road and turn right to access Redriff Road. The right turn from Lower Road on to Redriff Road and the left turn from Redriff Road on to Lower Road is not a conflicting movement which eases signal optimisation at the junction.

Figure 94 below shows the change in total traffic flow as a result of the re-design, along with the 'low-car' assumptions, as described above. This is done by comparing the option 2 design with the 'medium growth' development scenario.

Figure 94: 2031 flow difference between Option 2 with 'low car' demand and the medium growth scenario

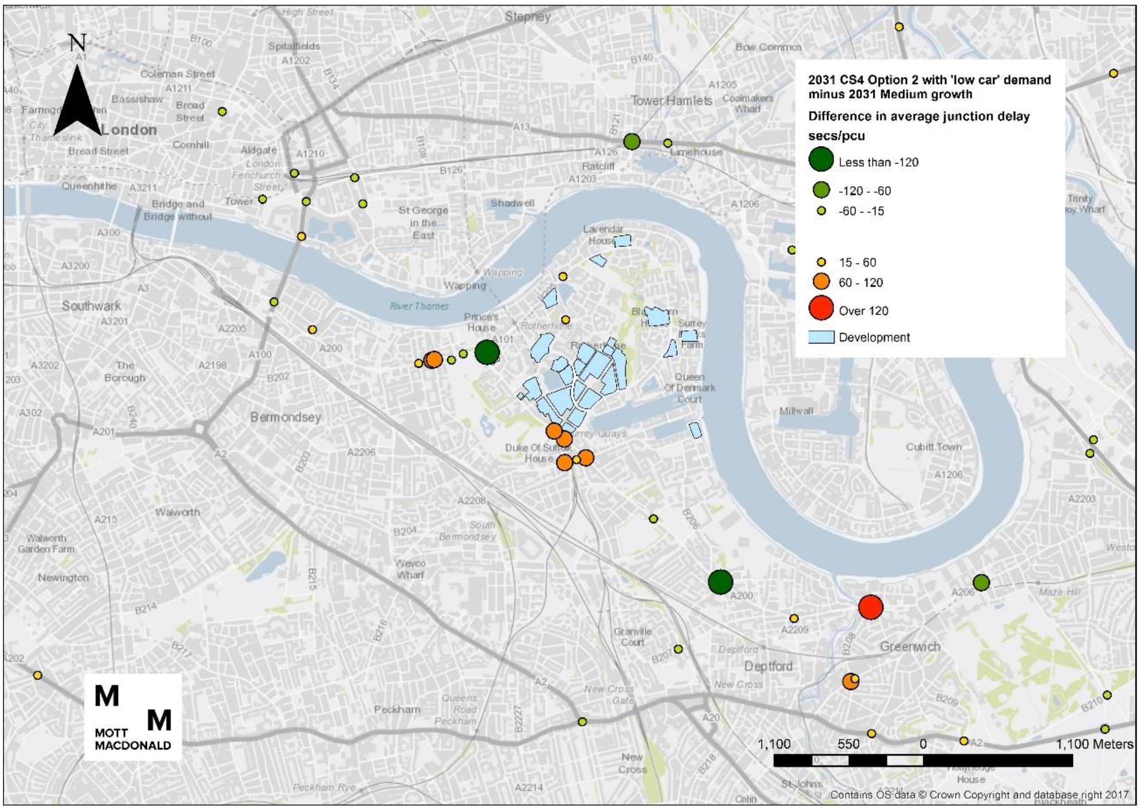


Source: Ordnance Survey data © Crown copyright and database right 2016

Similar to the option 1 design, there are large reductions in capacity on Jamaica Rd, Lower Rd and in to Lewisham and Greenwich as a result of road space re-allocation to CS4 results in large reductions in flow. Traffic is again displaced off the strategic network and re-routed on to Needleman Street, Salter Road, Southwark Park Road and other minor roads in Lewisham and Greenwich.

Figure 95 below shows the change in flow-weighted average junction delay using the same scenarios as above in **Figure 94**.

Figure 95: 2031 delay difference between Option 2 with 'low car' demand and the medium growth scenario

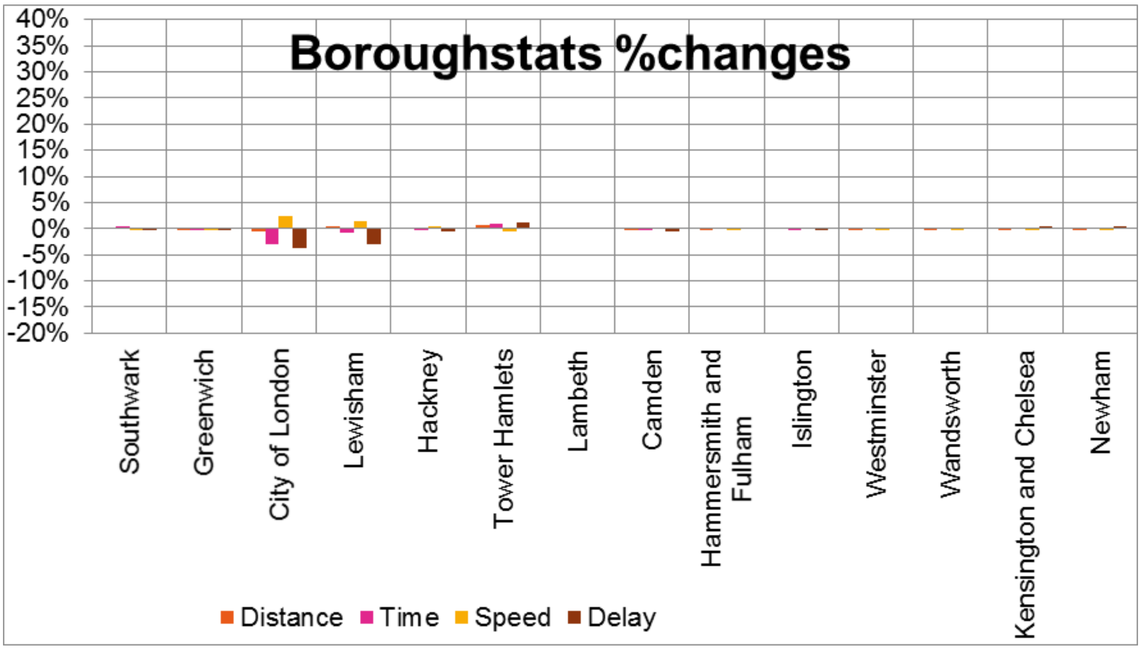


Source: Ordnance Survey data © Crown copyright and database right 2016

Figure 95 shows similar patterns to option 1 at Southwark Park Road, Rotherhithe Tunnel Roundabout, Salter Road and Needleman Street due to the designs being identical on Jamaica Road and in Lewisham and Greenwich. Designs are also similar along Lower Road except for the re-structuring of the gyratory. The gyratory re-structure offers more capacity than option 1 and whilst there is an increase in delay in option 2 due to the introduction of CS4 reducing overall capacity, the increase in delay in option 2 is smaller than the increase in option 1.

Figure 96 below gives a summary, for selected boroughs, of the percentage changes in overall delay, average speed, overall travel time and overall travel distance for option 1, using the same scenarios as seen in **Figure 94** and **Figure 95.** Full statistics can be seen in **Appendix B.7**.

Figure 96: Change in Borough statistics between Option 2 with 'low car' demand and the medium growth scenario



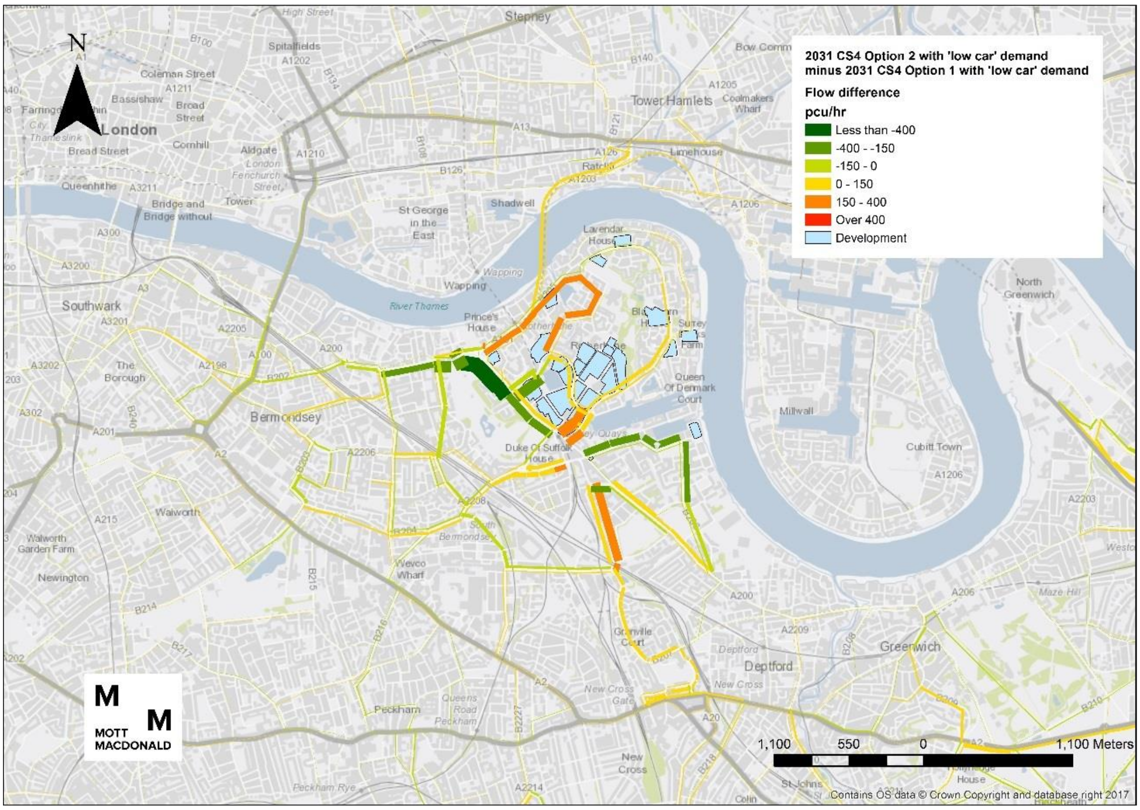
Source: HAM_BoroStats_3.8 - CW_Med_CS4Op2_lowcar.xlsm

It appears that the reductions in delay experienced by opening the emergency lane for access to the Rotherhithe Tunnel and the increased delay experienced around the gyratory due to the introduction of CS4 results in an overall zero net increase in delay for the entire borough. The decreases in delay in the City of London and Lewisham are the same effects as described for option 1.

11.2.3 Option 2 compared with Option 1

Figure 97 below shows the change in overall traffic flow change in Option 2 when compared to Option 1. The difference plot shows option 2 minus option 1 and therefore orange/red indicates higher flow in option 2 and green is a higher flow in option 1.

Figure 97: 2031 flow difference between Option 2 with 'low car' demand and Option 1 with 'low car' demand

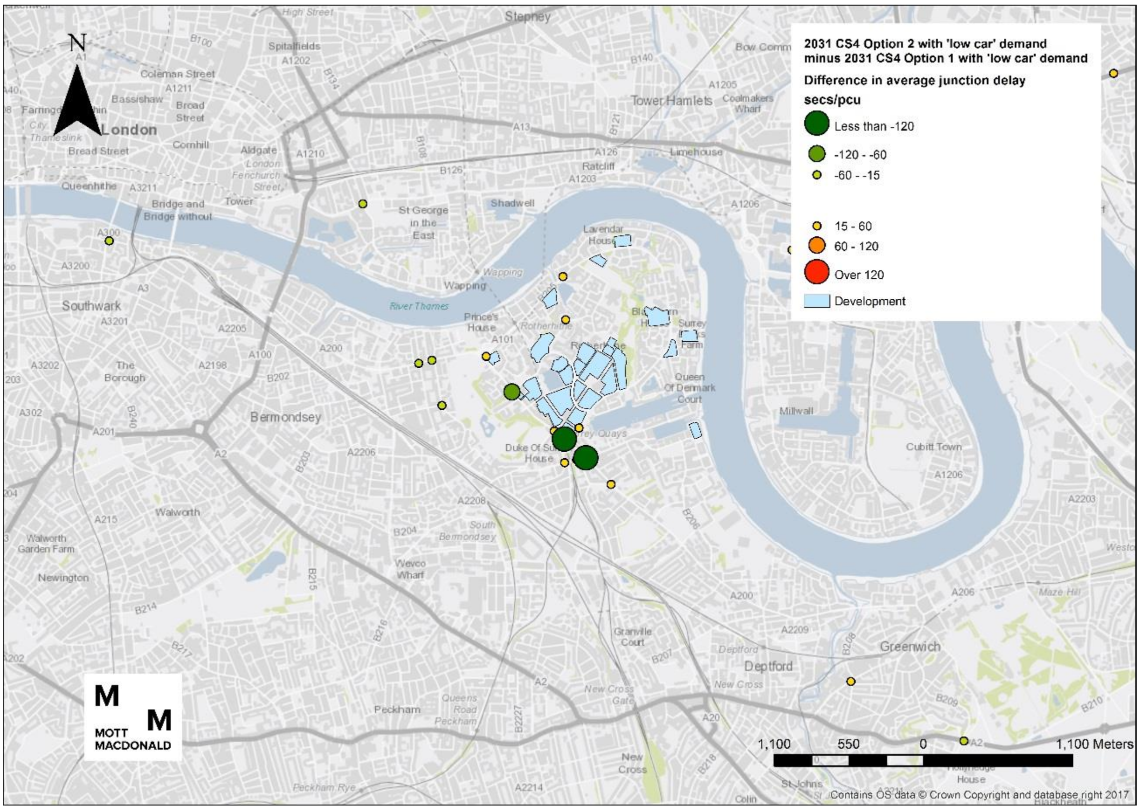


Source: Ordnance Survey data © Crown copyright and database right 2016

The plot above shows that option 1 retains more traffic on the strategic network i.e. Lower Road with option 2 displacing more traffic on to Needleman Street and Salter Road. Option 1 does displace more traffic on to Plough way and Grove Street but option 2 also displaces traffic on to Grinstead Road and Trundley's Road.

Figure 98 below shows the change in flow-weighted average junction delay between option 2 and option 1. The delay difference plot shows option 2 minus option 1 and therefore orange/red indicates higher delay in option 2 and green is a higher delay in option 1.

Figure 98: 2031 delay difference between Option 2 with 'low car' demand and Option 1 with 'low car' demand

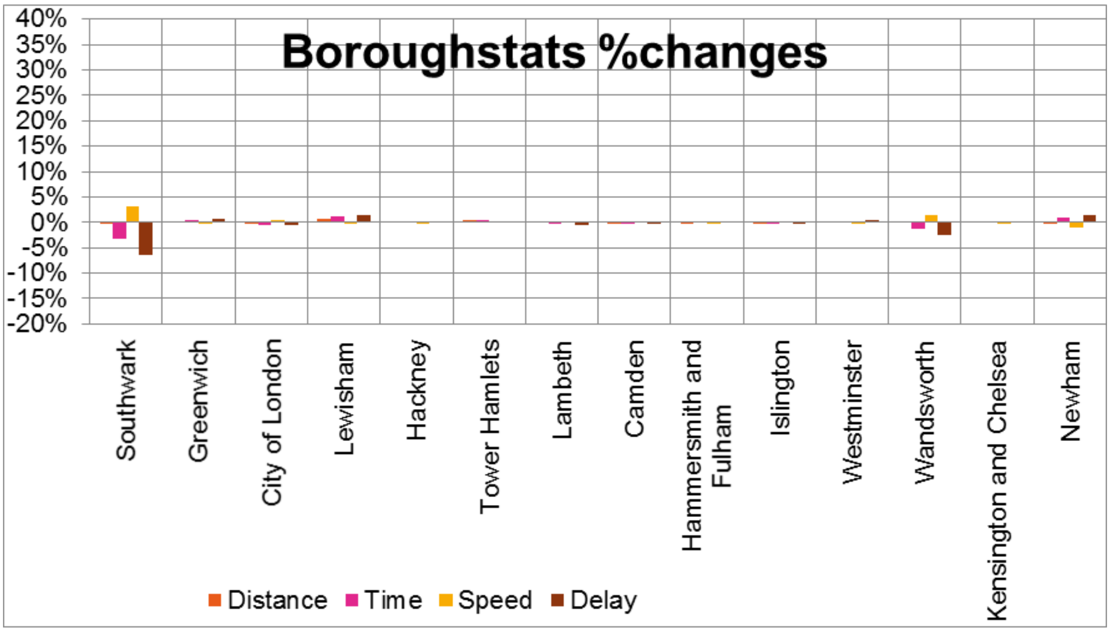


Source: Ordnance Survey data © Crown copyright and database right 2016

Option 1 gives much higher delay on Lower Road around the gyratory and also at the junction with Surrey Quays Road. Traffic re-routing off Lower Road and on to Needleman Street in option 2 only results in minor increases in delay at the junction with Salter Road.

Figure 99 below gives a summary, for selected boroughs, of the percentage changes in overall delay, average speed, overall travel time and overall travel distance for option 2 compared with option 1. Full statistics can be seen in **Appendix B.8**.

Figure 99: Change in Borough statistics between Option 2 with ‘low car’ demand and Option 1 with ‘low car’ demand



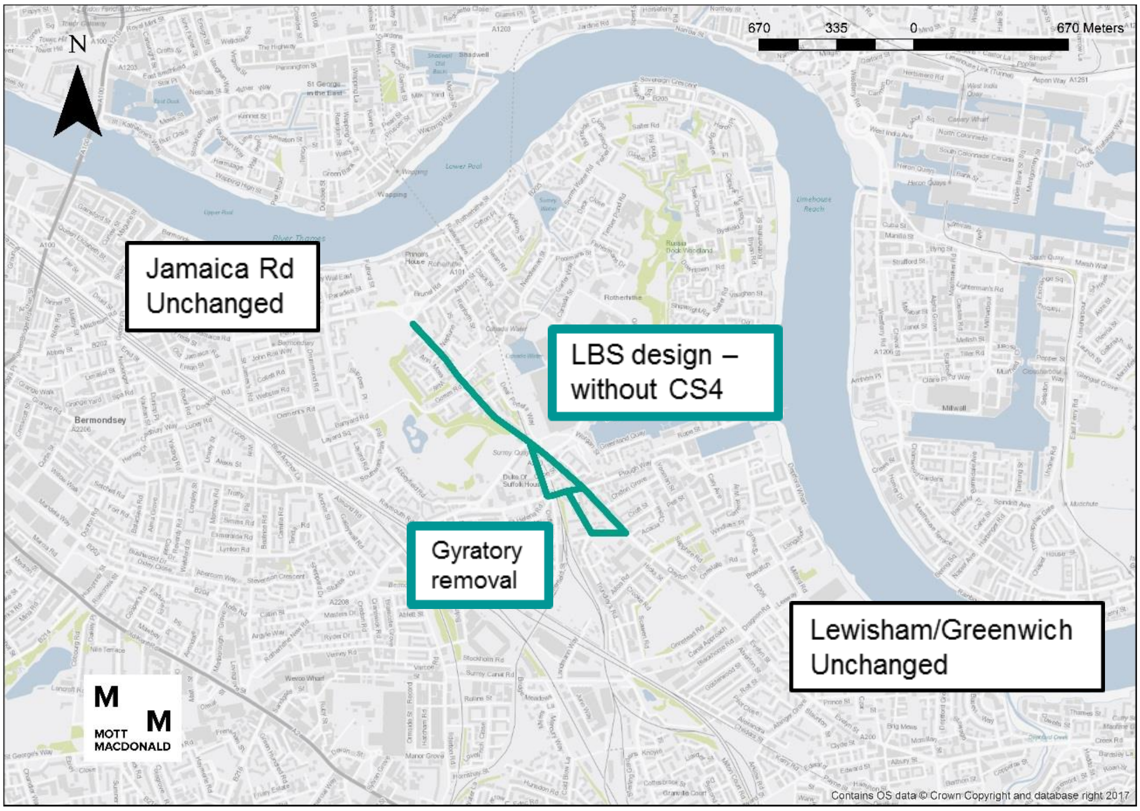
Source: HAM_BoroStats_3.8 - CW_Op2_minus_Op1_lowcar_Optimised.xlsm

As displayed above, the option 2 CS4 design offers approximately 6% less delay overall in the borough of Southwark. The reductions in delay in option 2 compared to option 1 are largely due to the more efficient operation of the Lower Road gyratory.

11.2.4 Option 3 – 'Do-minimum' network with LBS Lower Road design without CS4

Figure 100 below displays the coverage and extent of the LBS design on Lower Road.

Figure 100: Option 3

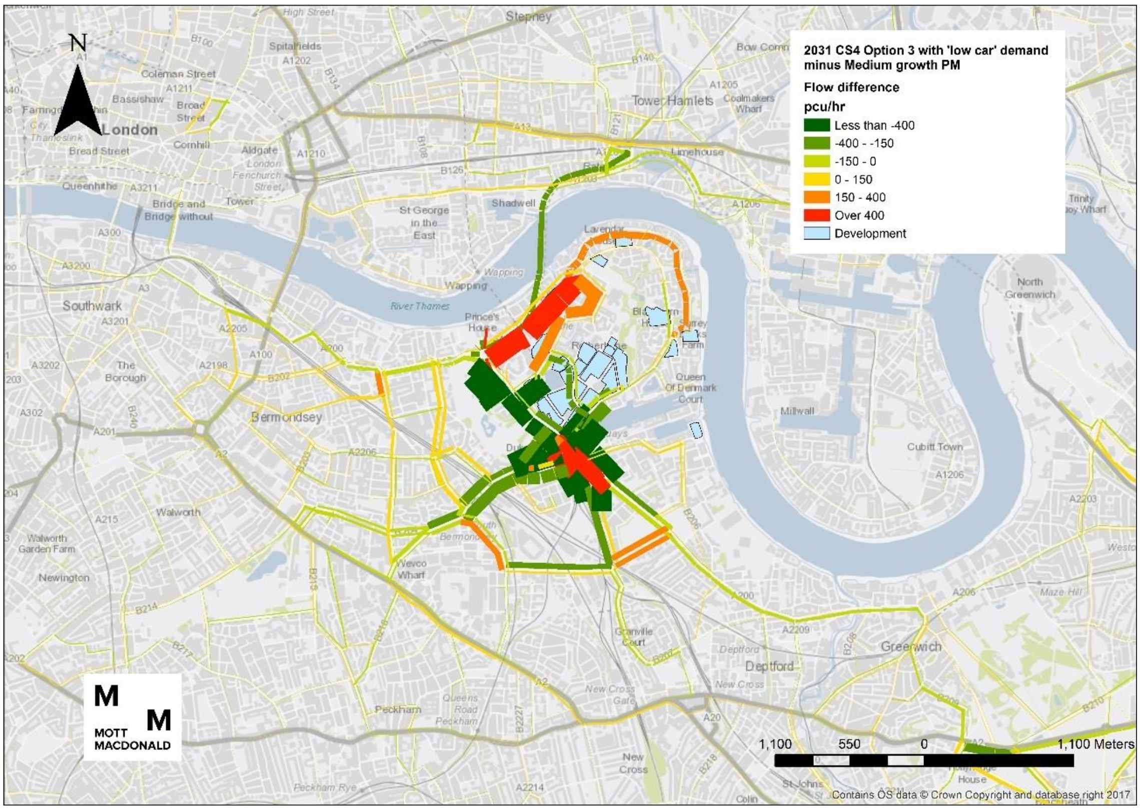


Source: Ordnance Survey data © Crown copyright and database right 2016

As shown above, Jamaica Road and the portions of the A200 in Lewisham/Greenwich remain the same as the 2031 reference case. The only change made to the network structure on Lower Road is the re-design of the gyratory with through trips allowed along Lower Road in both directions rather than using Bestwood Street/Bush Road/Rotherhithe Old Road for northbound traffic. The connection between the northern end of Rotherhithe Old Road and Lower Road is also 'detached' in this option and doesn't allow vehicles to make this movement.

Figure 101 below shows the difference in flow between the option 3 design with 'low-car' demand and the medium growth scenario.

Figure 101: 2031 flow difference between Option 3 with 'low car' demand and the medium growth scenario

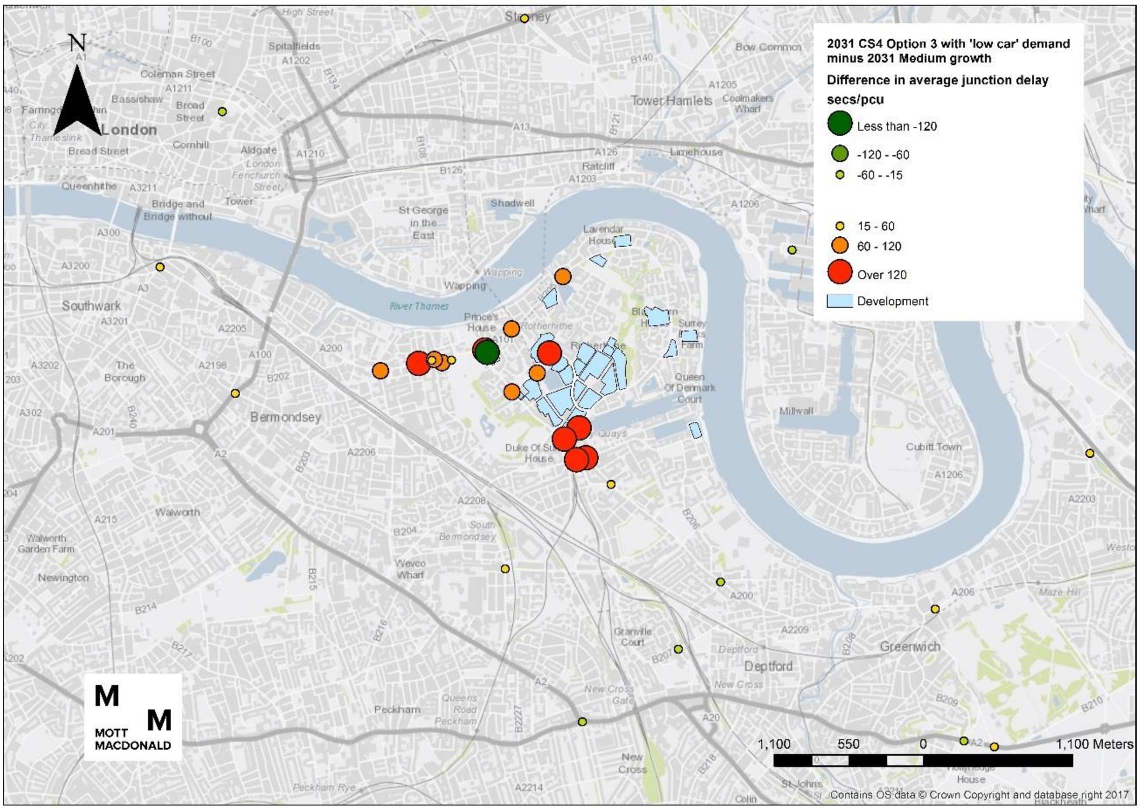


Source: Ordnance Survey data © Crown copyright and database right 2016

The flow difference plot above shows that the option 3 re-design re-distributes traffic from Lower Road primarily on to Needleman Street and Salter Road/Rotherhithe Street. The severe reductions in capacity on the Lower Road gyratory have increased delay along the corridor and discouraged traffic from using it as a sensible route choice.

Figure 102 below shows the change in average junction delay between the option 3 design and the medium growth scenario.

Figure 102: 2031 delay difference between Option 3 with 'low car' demand and the medium growth scenario

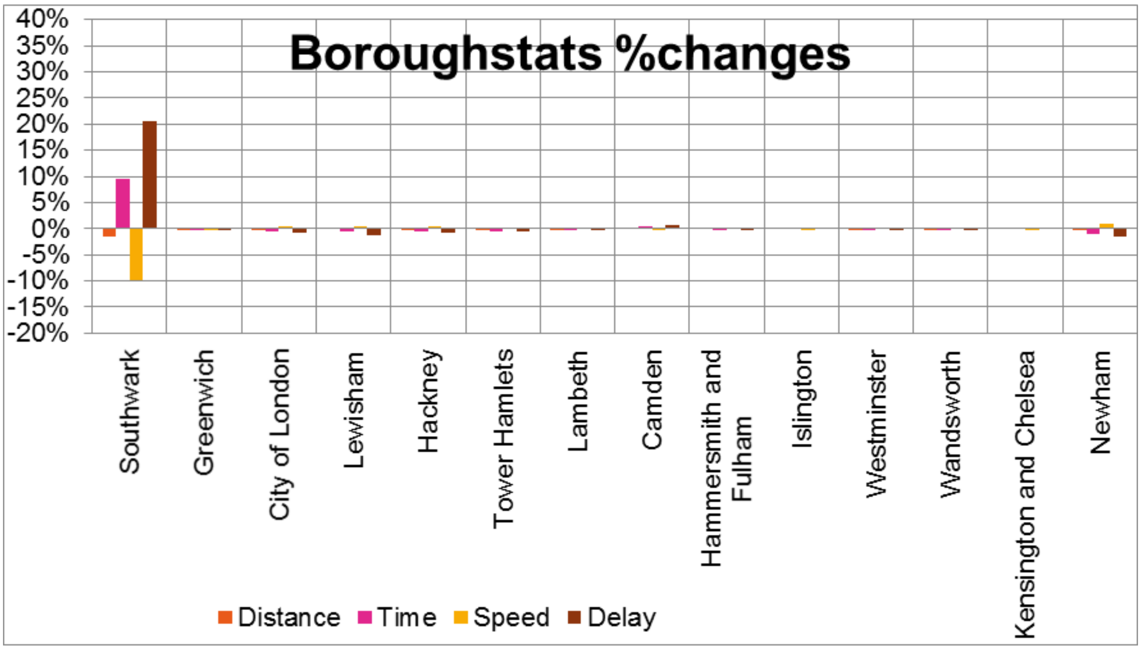


Source: Ordnance Survey data © Crown copyright and database right 2016

As described above, the re-structuring of the gyratory including reductions in capacity has resulted in severe delays on Lower Road. Traffic is re-routed and displaced on to minor surrounding roads as a result of this, as seen in **Figure 101**. As a result of this displacement, delay has also increased on junctions such as Southwark Park Road/Jamaica Road.

Figure 103 below gives a summary, for selected boroughs, of the percentage changes in overall delay, average speed, overall travel time and overall travel distance for option 3 compared with the medium growth scenario. Full statistics can be seen in **Appendix B.9**.

Figure 103: Change in Borough statistics between Option 3 with 'low car' demand and the medium growth scenario



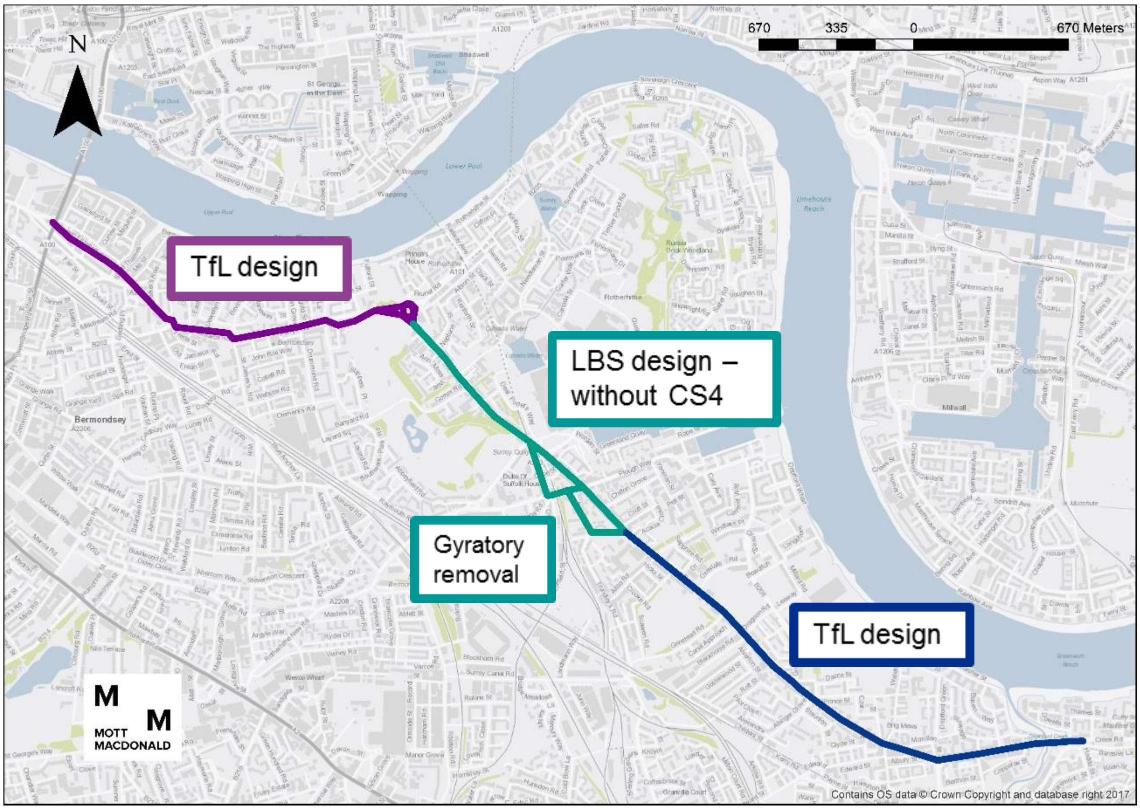
Source: HAM_BoroStats_3.8 - CW_Med_CS4Op3_lowcar.xlsm

As seen above, the gyratory re-structure increases delay in the area directly through capacity reduction on Lower Road and indirectly through re-routed traffic. Overall, this results in a 20% increase in delay across the entire borough.

11.2.5 Option 4 – As per Option 1 with LBS Lower Road design without CS4

Figure 104 displays the coverage and extent of the option 4 design. As shown, Jamaica Road and Lewisham/Greenwich use the same designs as options 1 and 2 with Lower Road using the same design as option 3.

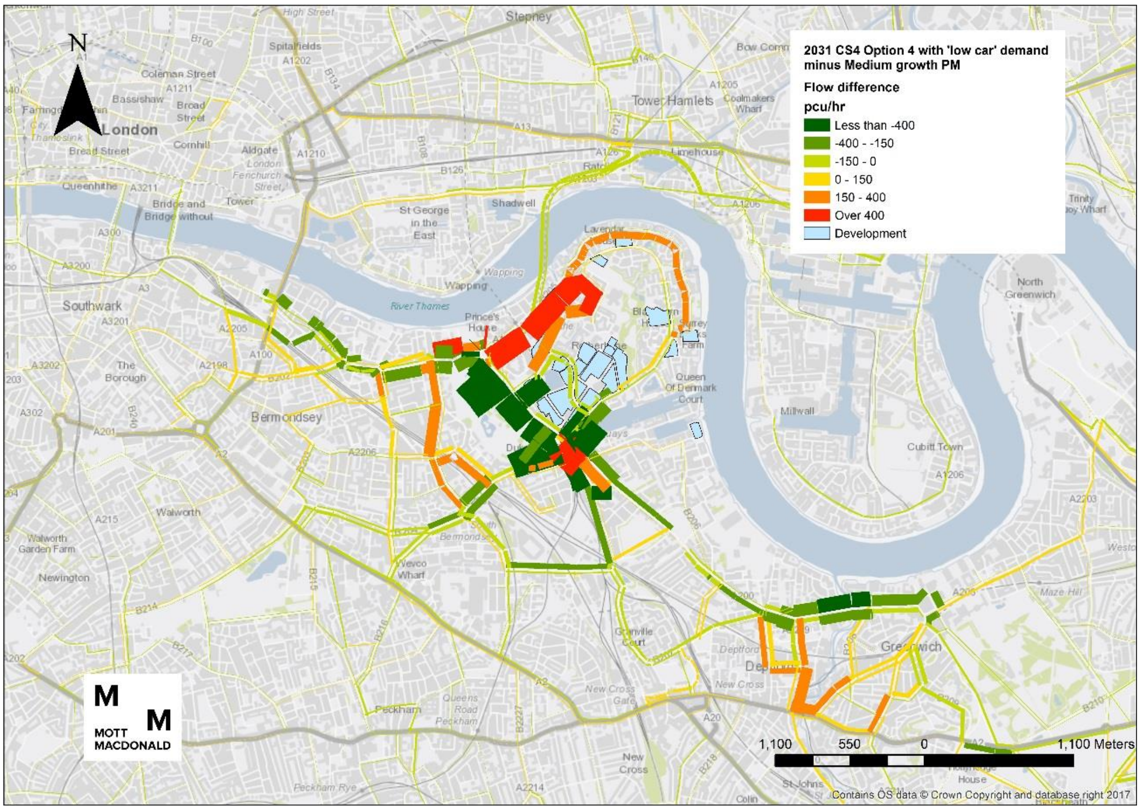
Figure 104: Option 4



Source: Ordnance Survey data © Crown copyright and database right 2016

Figure 105 below shows the difference in flow between the option 4 design with ‘low-car’ demand and the medium growth scenario.

Figure 105: 2031 flow difference between Option 4 with ‘low car’ demand and the medium growth scenario

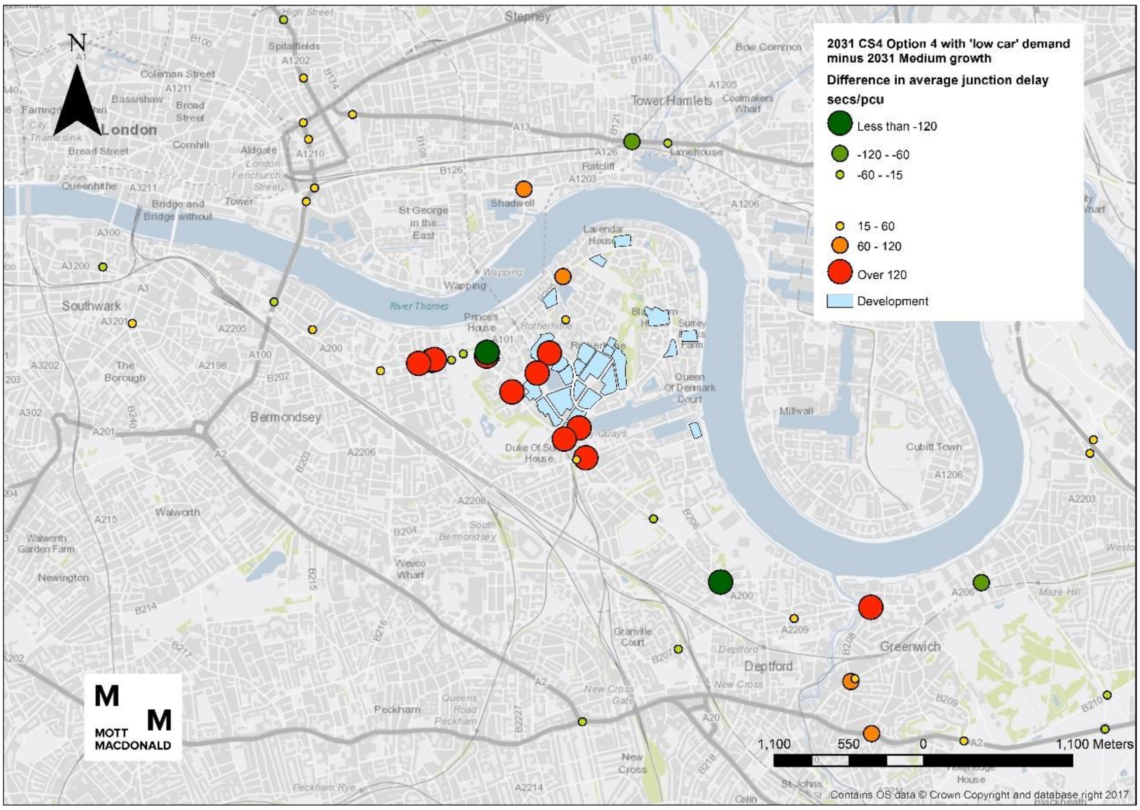


Source: Ordnance Survey data © Crown copyright and database right 2016

As shown above, option 4 contains design aspects from options 1, 2 and 3. Because of this, most of the effects shown in **Figure 105** can be seen in other options i.e. the large shift of traffic from Lower Road on to Needleman Street, Salter Road/Rotherhithe Street and Southwark Park Road; and the shift of traffic on to minor roads in Lewisham and Greenwich.

Figure 106 below shows the change in average junction delay between the option 3 design and the medium growth scenario.

Figure 106: 2031 delay difference between Option 4 with 'low car' demand and the medium growth scenario

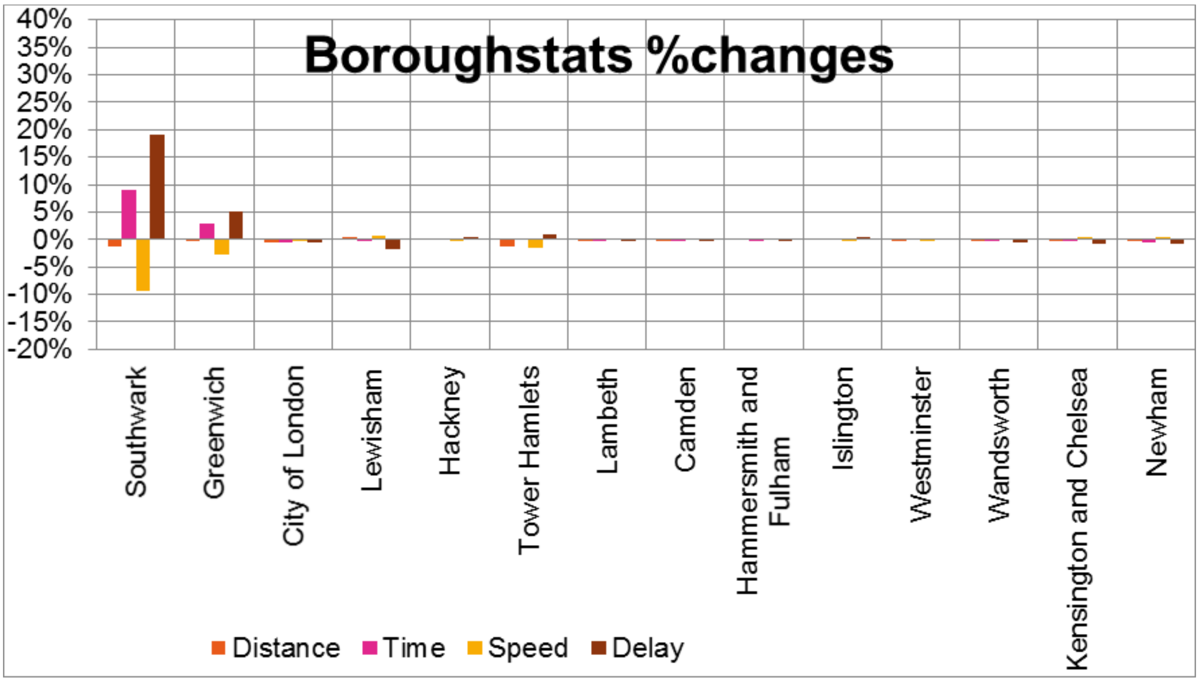


Source: Ordnance Survey data © Crown copyright and database right 2016

Similarly to option 3, the re-structuring of the Lower Road gyratory has resulted in much reduced capacity and thus has resulted in both delay on Lower Road and on surrounding minor roads. Delay is also increased in Lewisham/Greenwich due to reduced capacity following the introduction of CS4.

Figure 107 below gives a summary, for selected boroughs, of the percentage changes in overall delay, average speed, overall travel time and overall travel distance for option 3 compared with the medium growth scenario. Full statistics can be seen in **Appendix B.10**.

Figure 107: Change in Borough statistics between Option 3 with 'low car' demand and the medium growth scenario



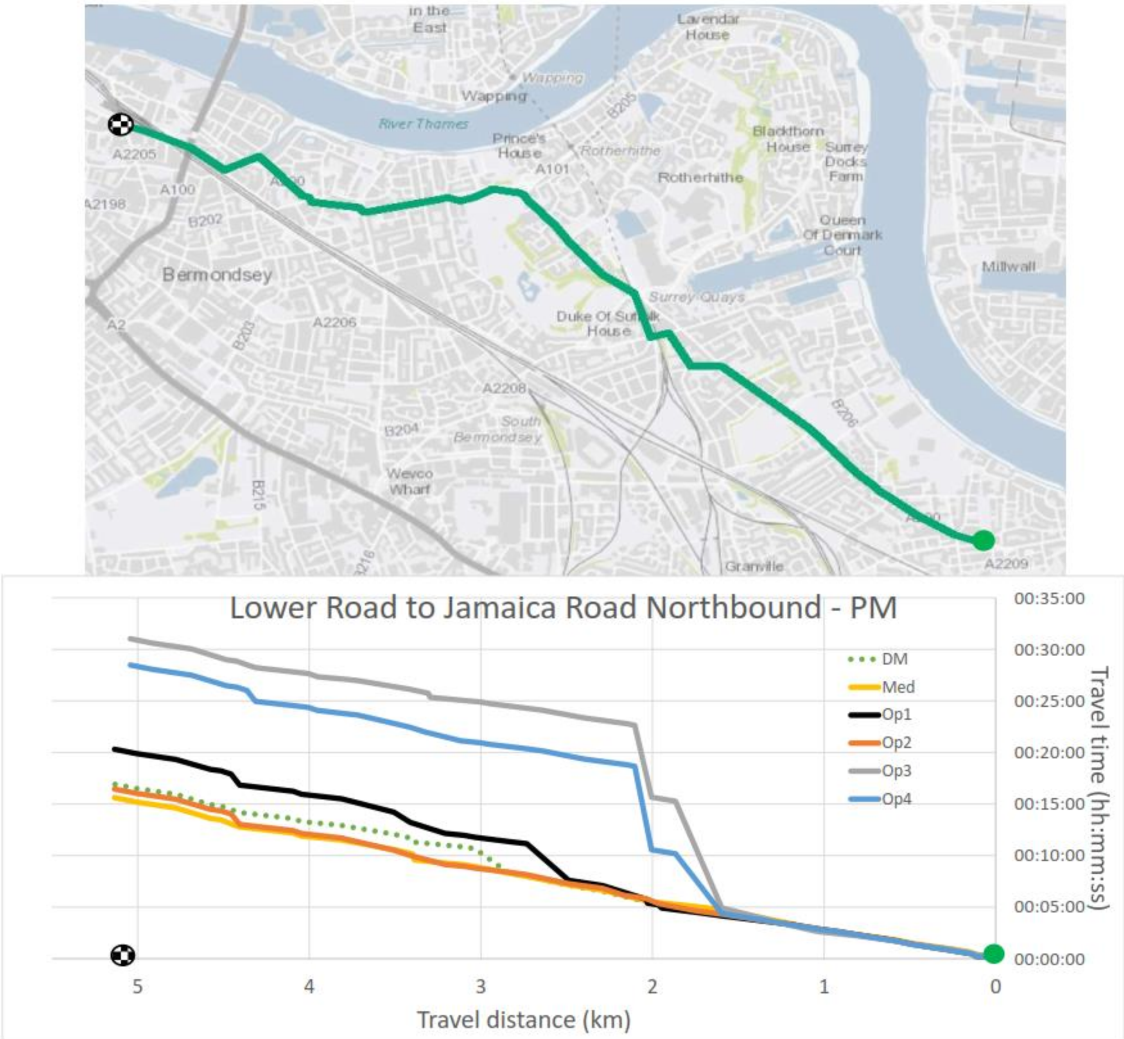
Source: HAM_BoroStats_3.8 - CW_Med_CS4Op4_lowcar.xlsm

Again, similarly to option 3, the gyratory re-structuring results in significant capacity reduction and results in large increases in delay in Southwark by approximately 20%.

11.2.6 Selected Route and Bus Route Journey Times

Figure 108 and **Figure 109** display how journey times along the A200 corridor between Tower Bridge and Deptford are affected by the corridor re-designs.

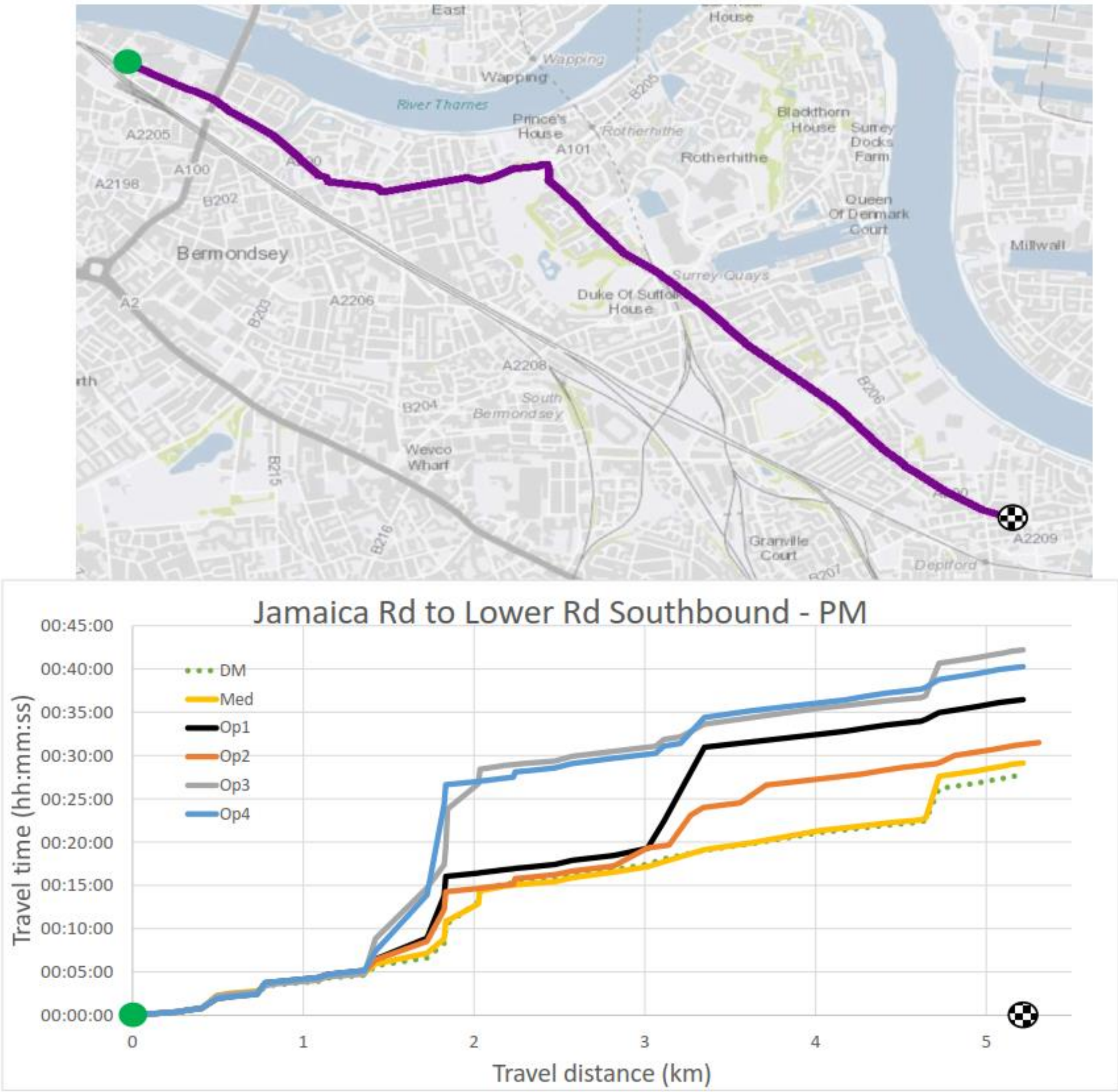
Figure 108: Journey times from Lower Road to Jamaica Road Northbound



Source: CW Journey Times_PM_v5_InterventionsPt2_lowcar_v5Optimised.xlsx

Figure 108 above displays expected journey times heading northbound along the A200 corridor. Both option 3 and 4 experience significant levels of delay at the Lower Road gyratory. Options 1 and 2 both experience much less delay around the gyratory with option 2 even offering faster and smoother journey times than the 2031 ‘do-minimum’ development scenario.

Figure 109: Journey times from Jamaica Road to Lower Road Southbound



Source: CW Journey Times_PM_v5_InterventionsPt2_lowcar_v5Optimised.xlsx

Figure 109 above displays expected journey times heading southbound along the A200 corridor. All scenarios experience expected delay at the Rotherhithe Tunnel roundabout with options 1 and 2 offering faster and smoother journey times through here compared to options 3 and 4. Options 1 and 2 do experience some delay when passing through the Lower Road gyratory with option 2 giving a faster, smoother journey time through here and along the entire route.

Figure 110, Figure 111 and **Figure 112** show similar journey time plots, for the same design options as above, for three key bus routes in the Canada Water area; 188, 381 and C10 in both directions.

Figure 110: 188 Bus Route Journey Times Eastbound & Westbound

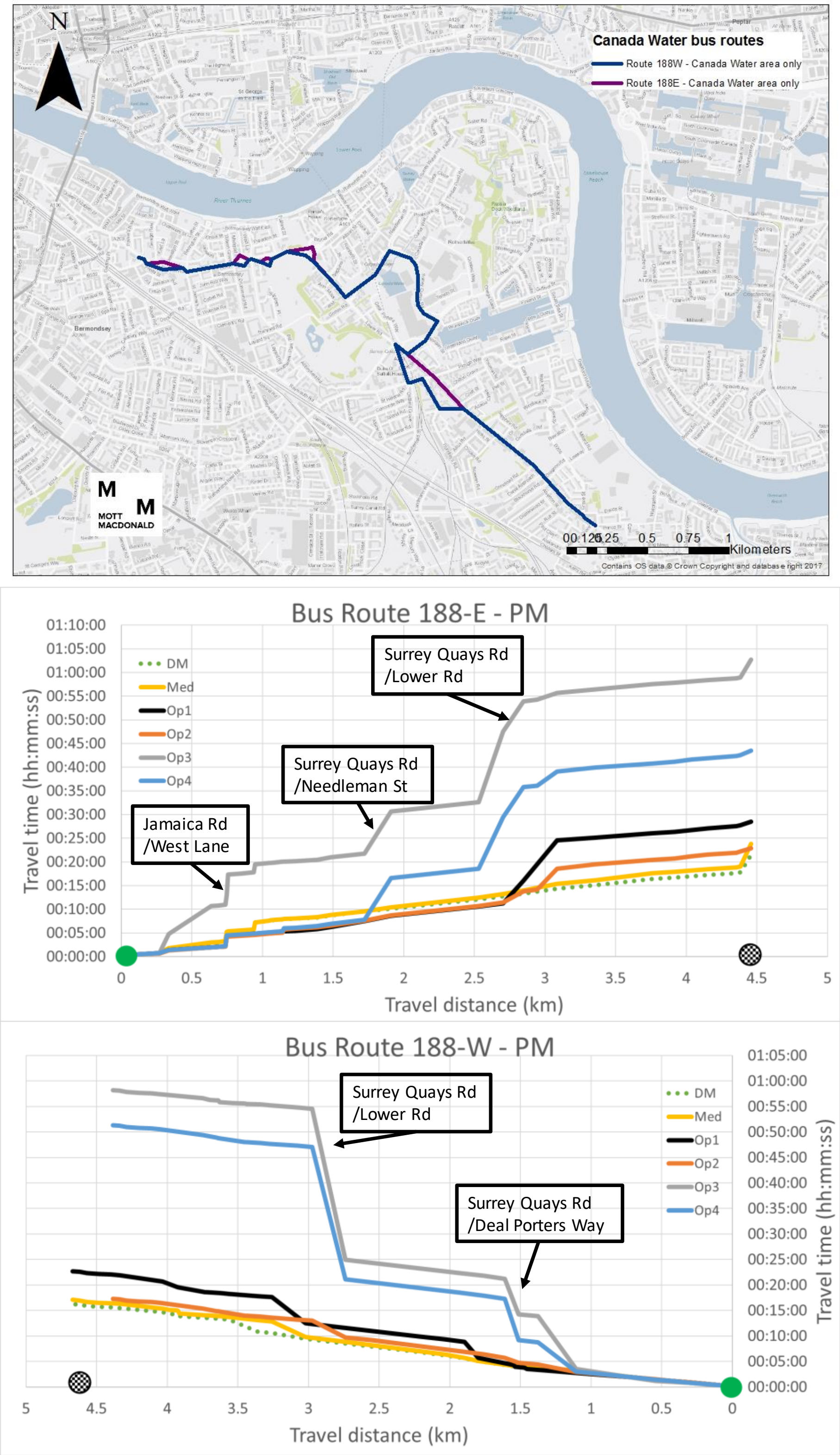
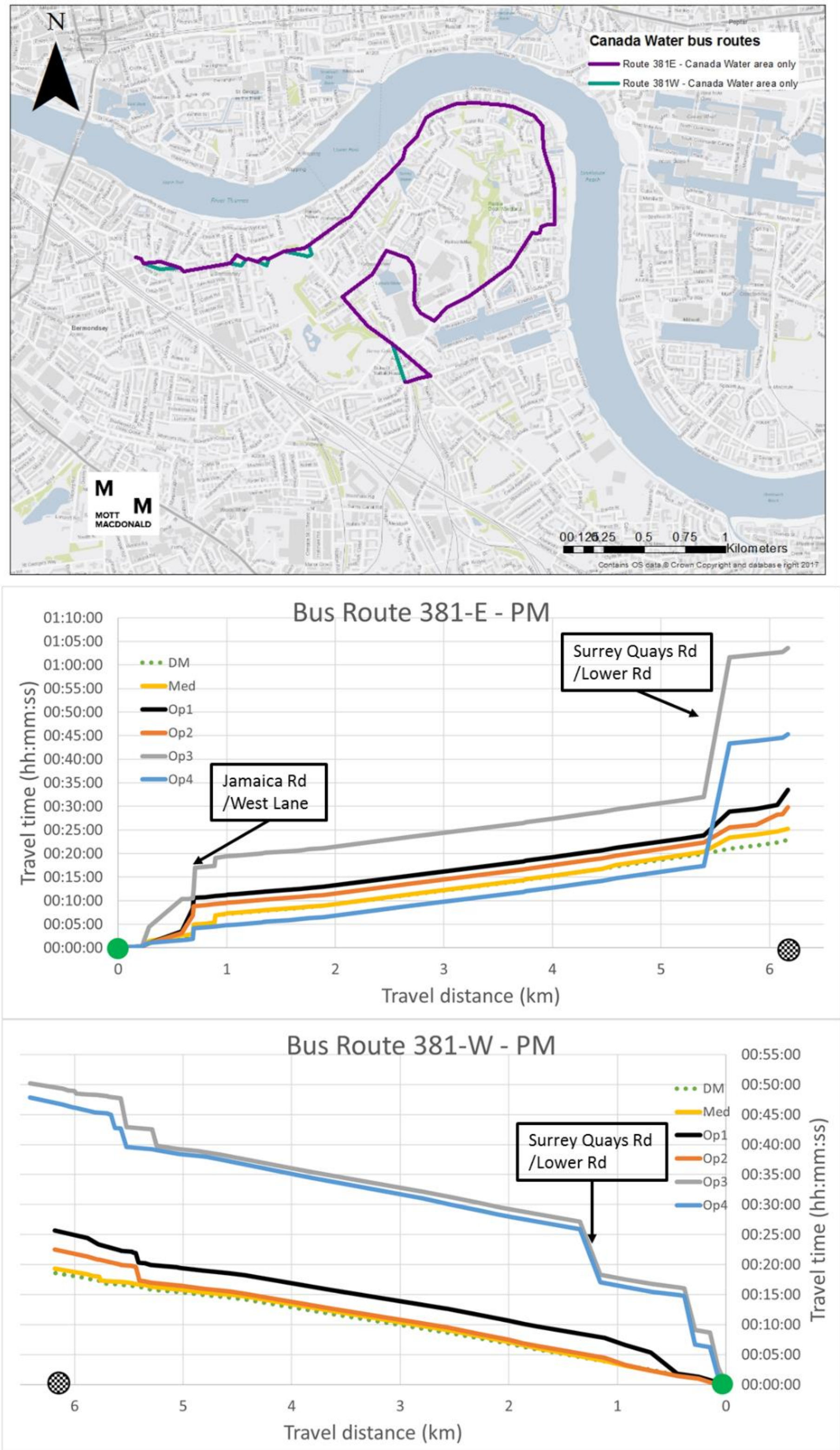
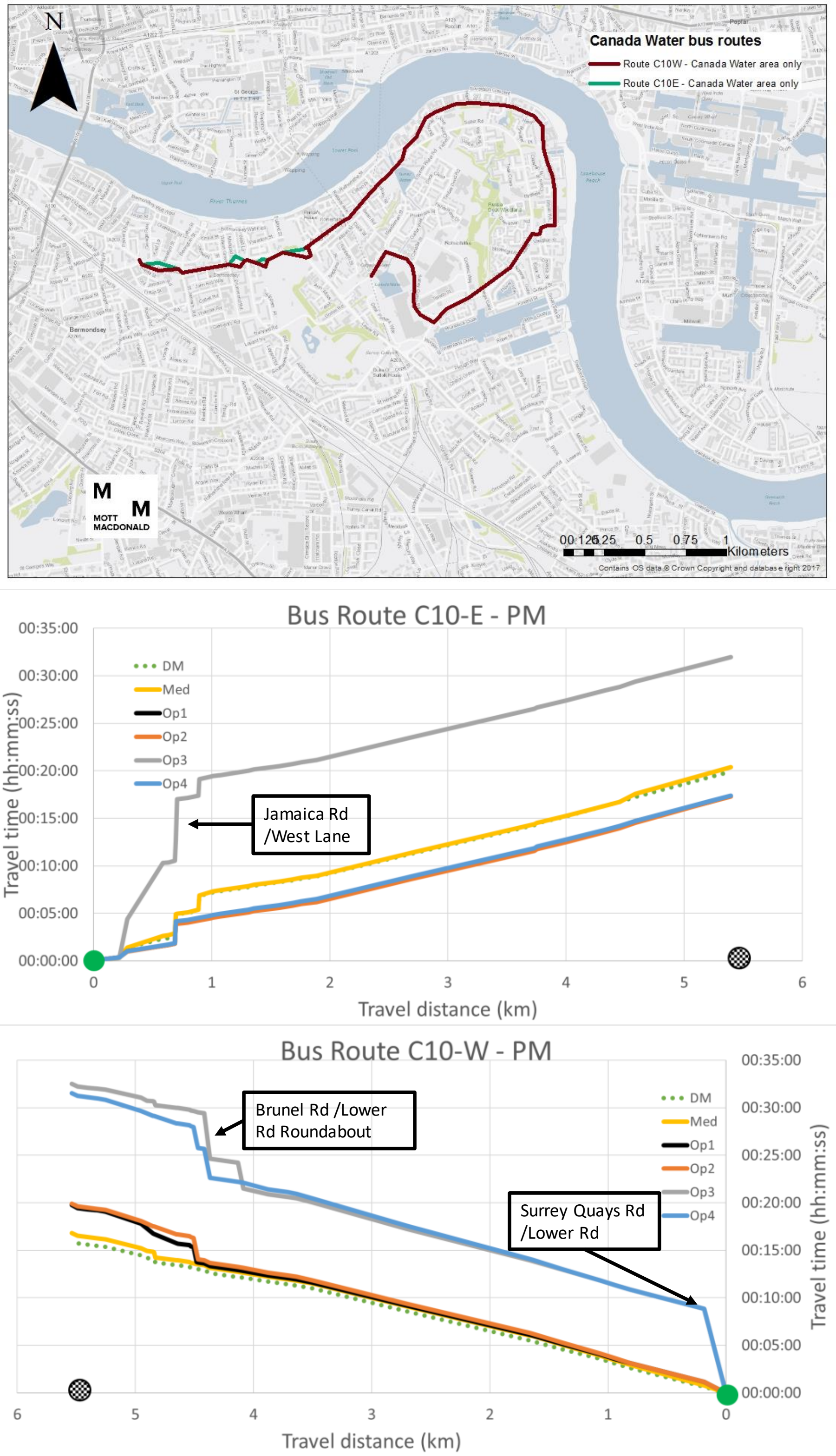


Figure 111: 381 Bus Route Journey Times Eastbound & Westbound



Source: CW Journey Times_PM_v5_InterventionsPt2_lowcar_v5Optimised.xlsx

Figure 112: C10 Bus Route Journey Times Eastbound & Westbound



Source: CW Journey Times_PM_v5_InterventionsPt2_lowcar_v5Optimised.xlsx

Bus route 188, as seen in **Figure 110**, indicates that more severe delay is experienced when turning off Lower Road and on to Surrey Quays Road in both directions in the option 3 and 4 designs. Option 2 gives the fastest and smoothest journey time for this route, with total travel time similar to the medium growth and do-minimum development scenarios.

Bus routes 381 and C10, as seen in **Figure 111** and **Figure 112**, follow similar routes and thus give similar results, with delays experienced on the roundabout approach heading eastbound and also joining Lower Road from Surrey Quays Road for option 3 in particular. Again, option 2 appears to give the fastest and smoothest journey times for these routes in both directions with option 1 also giving similar results.

11.2.7 CS4 Re-designs Summary

Following discussions and based on results shown above, both option 3 and option 4 have both been discounted for policy and network performance reasons.

Option 1 displays large reductions in capacity on Jamaica Road, Lower Road and in to Lewisham and Greenwich as a result of road space re-allocation to CS4 results in large reductions in flow. There are also significant increases in delay around the Lower Road gyratory. Whilst option 2 displays similar levels of displaced traffic, the difference in capacity around the Lower Road gyratory with option 1 results in less of an increase in delay around here, whilst also introducing CS4 to the network.

Overall option 2 appears to perform better than option 1 in the Canada Water area.

11.3 Rotherhithe Tunnel Charging

The Silvertown Tunnel has recently become a committed scheme, and is therefore not included in the do-minimum network. The introduction of the Silvertown Tunnel will also introduce a user charge to both the Silvertown Tunnel and the Blackwall Tunnel. As a result of the introduction of user charging, an attractive, alternative option for those crossing the river and unwilling to pay the user charge would be to use the Rotherhithe Tunnel. Tests were therefore undertaken whereby the Silvertown Tunnel scheme was introduced to the network and sensitivity tests surrounding the implementation of a user charge on Rotherhithe Tunnel were done.

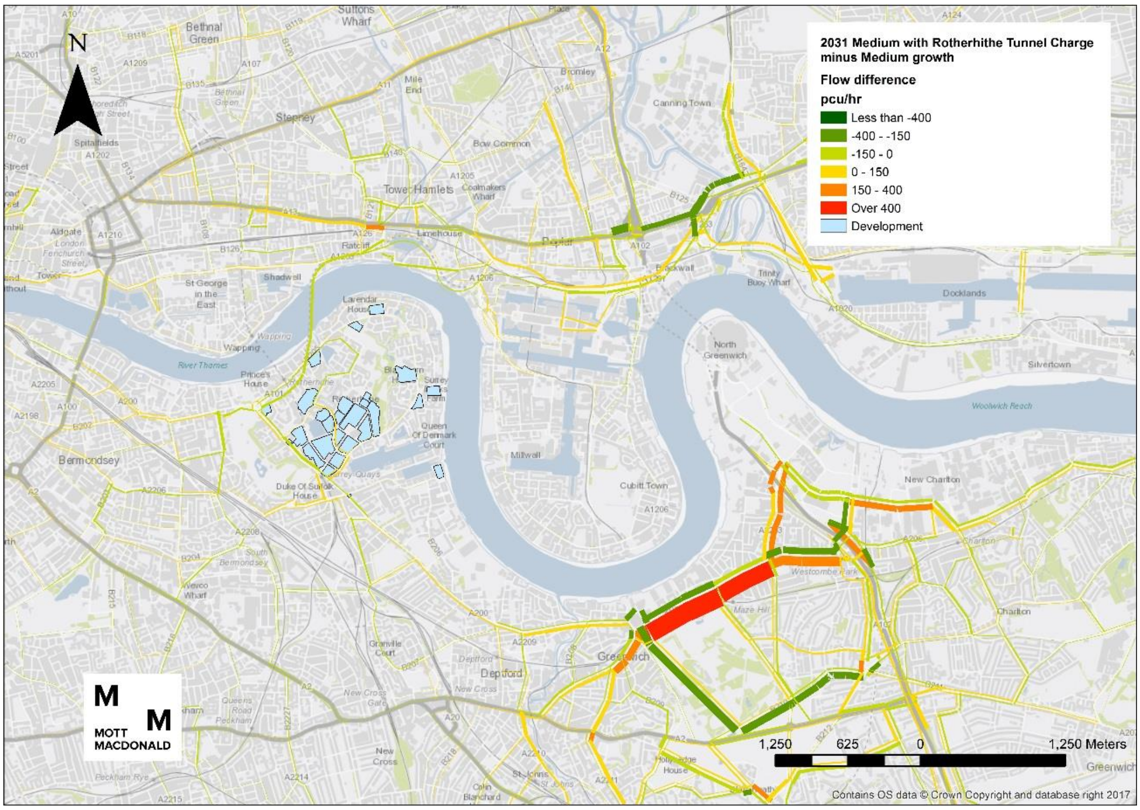
11.3.1 Rotherhithe Tunnel charge only

The first test undertaken introduces a user charge on Rotherhithe Tunnel without the Silvertown Tunnel present in the network. This was done to understand the effects of the Rotherhithe Tunnel charge in isolation. The toll applied to the Rotherhithe Tunnel is the same as the toll that would be applied to the Silvertown Tunnel and Blackwall Tunnel i.e. £3 southbound and £1 northbound in 2017 prices in the PM peak.

Tests were undertaken that included the Rotherhithe Tunnel charge in a scenario with and without the Silvertown Tunnel in place. This was done to fully understand how the presence of the Silvertown Tunnel is likely to affect Rotherhithe Tunnel demand with a charge in place. The tests indicated that the presence of the Silvertown Tunnel had minimal material impact on Rotherhithe Tunnel and Canada Water area demand.

Figure 113 below displays the change in total actual flow when the Rotherhithe Tunnel Charge is introduced to the medium growth scenario when compared with the medium growth scenario.

Figure 113: Medium growth with Rotherhithe Tunnel Charge compared with Medium growth – Flow Difference

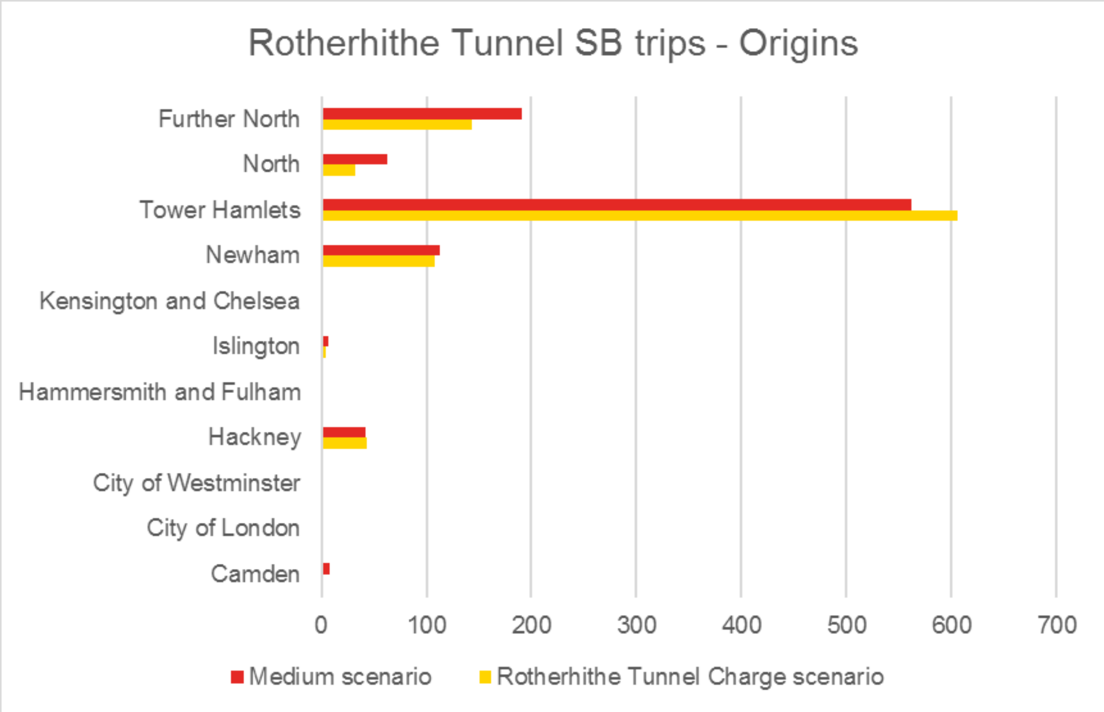


Source: Ordnance Survey data © Crown copyright and database right 2016

The plot above displays a minor reduction (approx. 85 pcus) in southbound traffic using the Rotherhithe Tunnel and thus a minor reduction in traffic in the Canada Water area and southbound on Lower Road. The £1 toll in the northbound direction has minimal effect and has resulted in no change in flow in the tunnel. As displayed above, the charge on the Rotherhithe Tunnel has resulted in large increases in traffic heading westbound through Greenwich on Trafalgar Road to avoid the toll.

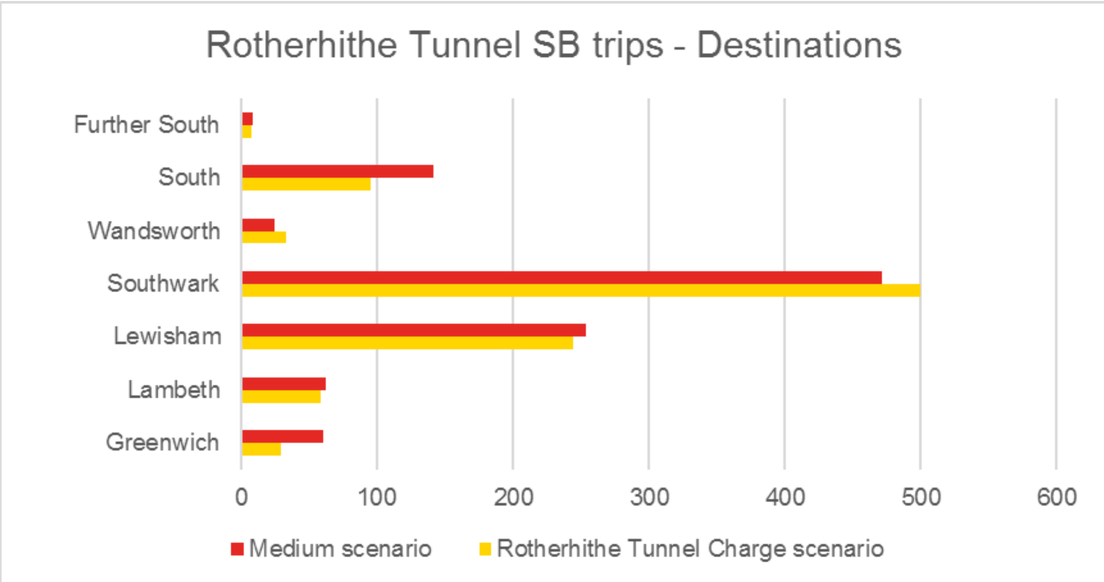
Figure 114 and **Figure 115** below display the total trip origins and destinations of southbound tunnel users with and without the Rotherhithe Tunnel charge in place.

Figure 114: Rotherhithe Tunnel Southbound trip origins (pcu/hr)



Source: RotherhitheSLA_tripends_v2_Med_against_RTC.xlsx

Figure 115: Rotherhithe Tunnel Southbound trip destinations (pcu/hr)

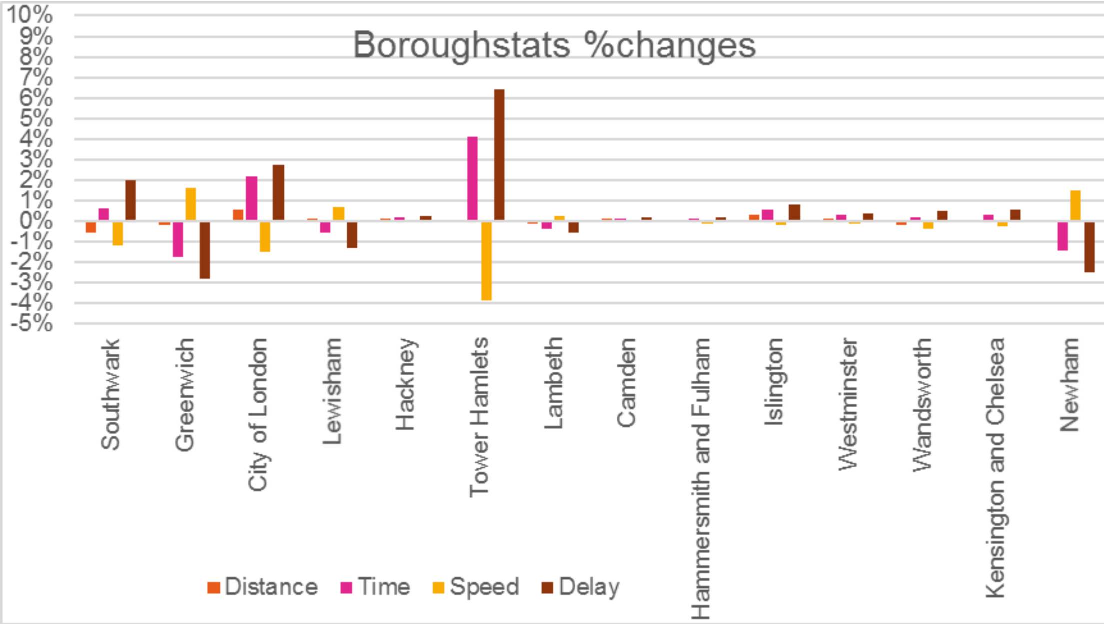


Source: RotherhitheSLA_tripends_v2_Med_against_RTC.xlsx

The plots above show that while there is a net decline in Rotherhithe Tunnel southbound trips due to the deterrent of the toll (as seen in **Figure 113**), there are increases in local trips using the tunnel, starting their journey in Tower Hamlets and ending in Southwark. Also shown above is a decline in longer distance trips heading southbound in the tunnel as the toll is introduced, originating in North GLA and beyond and arriving in South GLA.

Figure 116 below shows the difference in travel distance, travel time, average speed and delay experienced for each of the selected boroughs when comparing the medium growth scenario with the Rotherhithe Tunnel Charge in place with the medium growth development scenario.

Figure 116: 2031 Medium growth with Rotherhithe Tunnel Charge compared with Medium growth – Borough Statistics



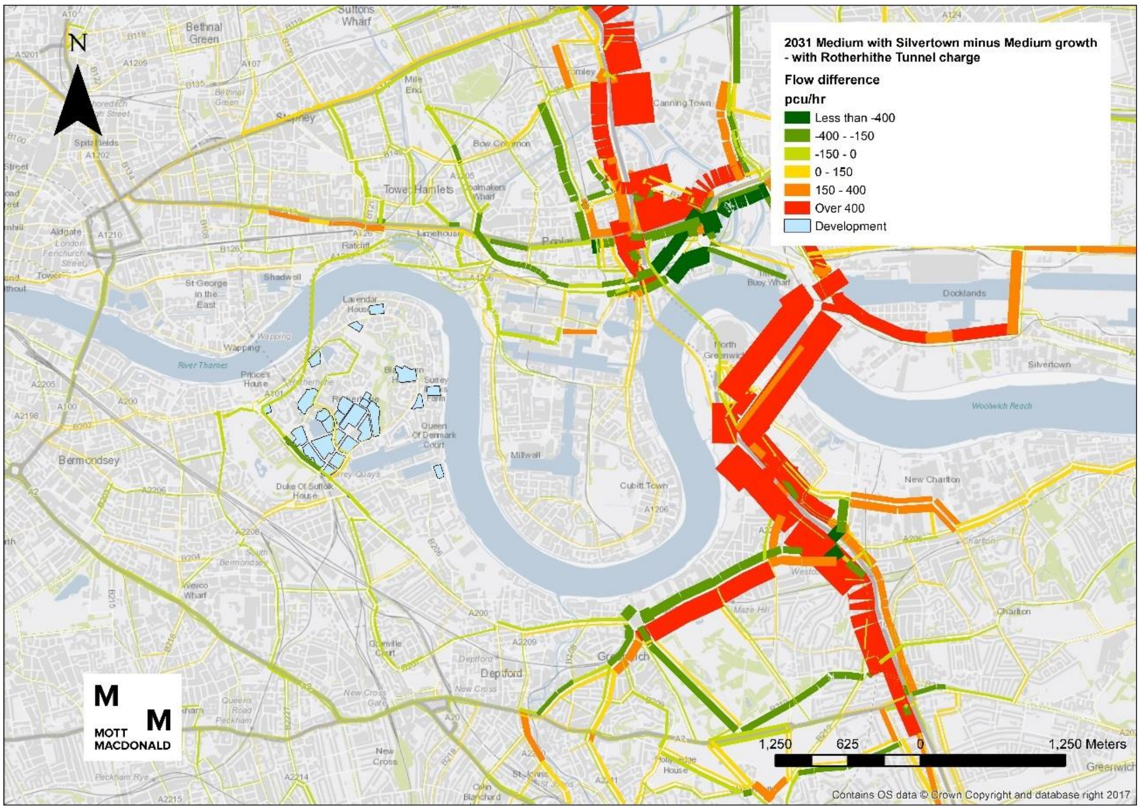
Source: HAM_BoroStats_3.8 - CW_Med_RTC.xlsm

The plot above reveals that despite the Rotherhithe Tunnel Charge reducing levels of traffic in the Canada Water area, the minor increase in southbound traffic on Tower Bridge, which is already operating over capacity in the medium growth scenario, results in a significant increase in delay at the southern end of the bridge i.e. within Southwark and thus results in a 2% net increase in delay for the borough. Full statistics can be seen in **Appendix B.3**.

11.3.2 Silvertown Tunnel with Rotherhithe Tunnel Charge

Figure 117 below shows the flow differences between the medium growth development scenario and the medium growth scenario with the Silvertown Tunnel in place with a toll applied to the Silvertown Tunnel, Blackwall Tunnel and Rotherhithe Tunnel.

Figure 117: Medium growth with Silvertown Tunnel and Rotherhithe Tunnel Charge compared with Medium growth – Flow Difference

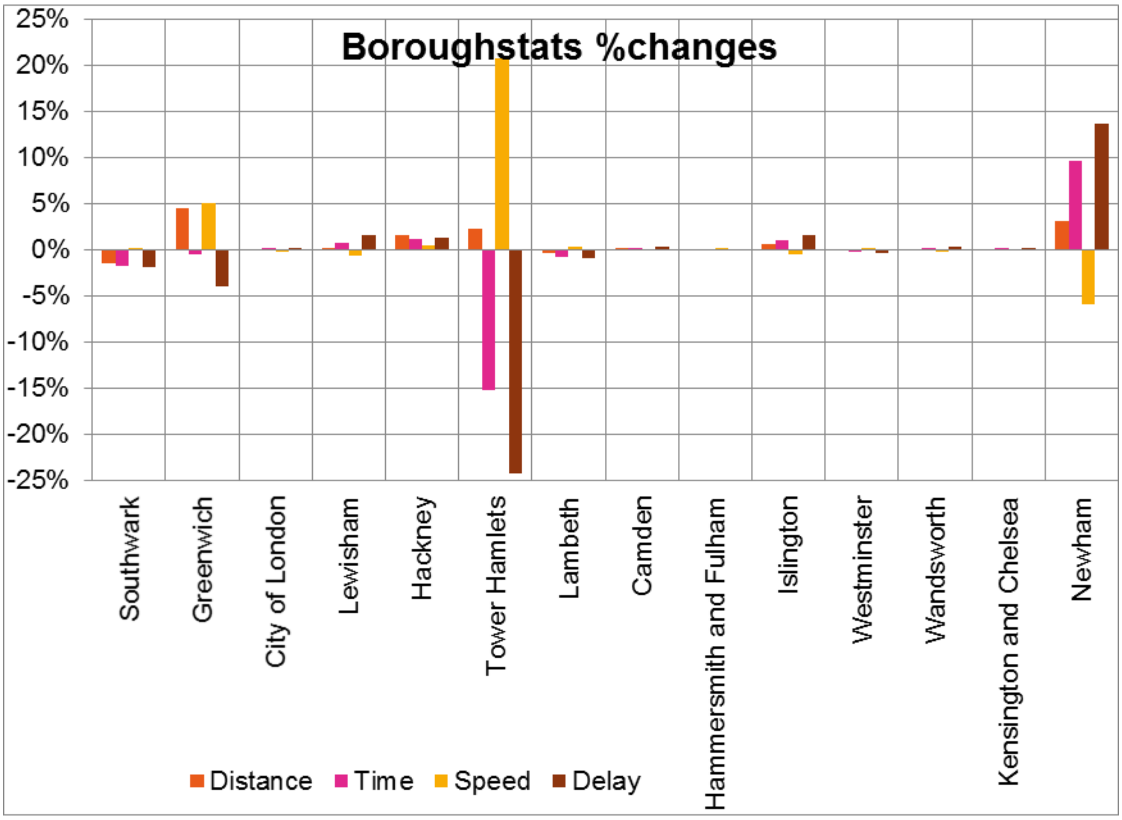


Source: Ordnance Survey data © Crown copyright and database right 2016

The plot above shows similar levels of decline in traffic southbound in the Rotherhithe Tunnel as the scenario with the Rotherhithe Tunnel Charge only (**Figure 113**). **Figure 113** displays a reduction in southbound tunnel traffic of approx. 85 pcus/hr (8% reduction) and **Figure 117** displays a reduction of approx. 98 pcus/hr (9% reduction). This difference in proportions is not significant at a 5% level (when using the hypothesis test for proportionality) and therefore the introduction of the Silvertown Tunnel does not have a significant impact on traffic flows in the Rotherhithe Tunnel.

Figure 118 below shows the change in borough statistics for the medium growth scenario with Silvertown Tunnel and the Rotherhithe Tunnel Charge in place compared with the medium growth scenario.

Figure 118: Medium growth with Silvertown Tunnel and Rotherhithe Tunnel Charge compared with Medium growth – Borough Statistics



Source: HAM_BoroStats_3.8 - CW_Med_STRC.xlsm

The chart above shows that as the Rotherhithe Tunnel Charge is introduced to the network along with the Silvertown Tunnel there are similar significant changes in Greenwich, Tower Hamlets and Newham as seen in **Figure 118**. There are minor net decreases in delay in Southwark in the chart above, however, the reductions in delay without the Rotherhithe Tunnel Charge in place are greater than the scenario which does include the charge; this is due to an increase in delay on Tower Bridge, as traffic avoids paying the toll, as described above in **Section 11.3.1**. Full statistics can be seen in **Appendix B.5**.

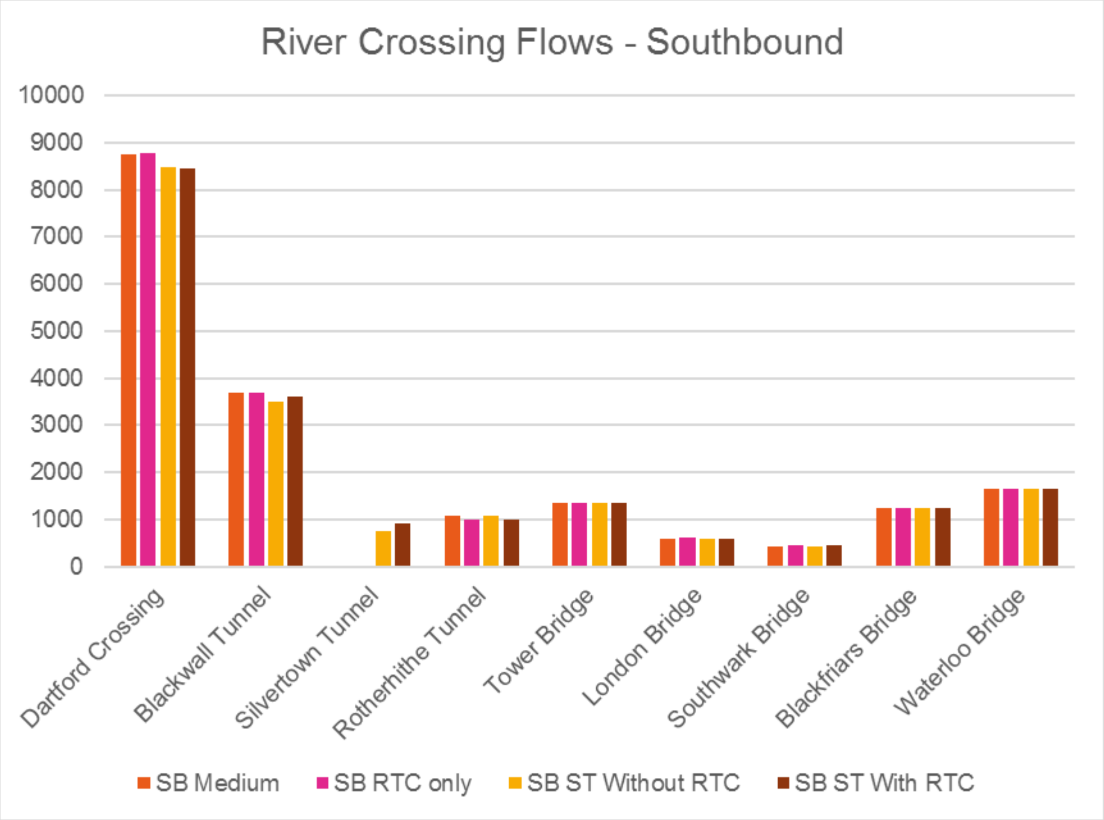
11.3.3 Summary

Figure 119 shows the change in southbound flows crossing the river at all crossings in East London in the PM peak (Waterloo Bridge to Dartford Crossing – not including the Woolwich Ferry which remains unchanged in all scenarios).

Four scenarios are displayed: Medium growth, Rotherhithe Tunnel Charge only (RTC only), Silvertown Tunnel without Rotherhithe Tunnel Charge (ST without RTC) and Silvertown Tunnel with Rotherhithe Tunnel Charge (ST with RTC).

The Rotherhithe Tunnel southbound flow remains at its capacity of approximately 1,100 pcus/hr for both the medium growth scenario and the scenario without the Rotherhithe Tunnel Charge; there are minor reductions when a £3 toll is introduced with a small increase in the Silvertown Tunnel when the Rotherhithe Tunnel Charge is in place.

Figure 119: River Crossing Flows – Southbound (pcu/hr)



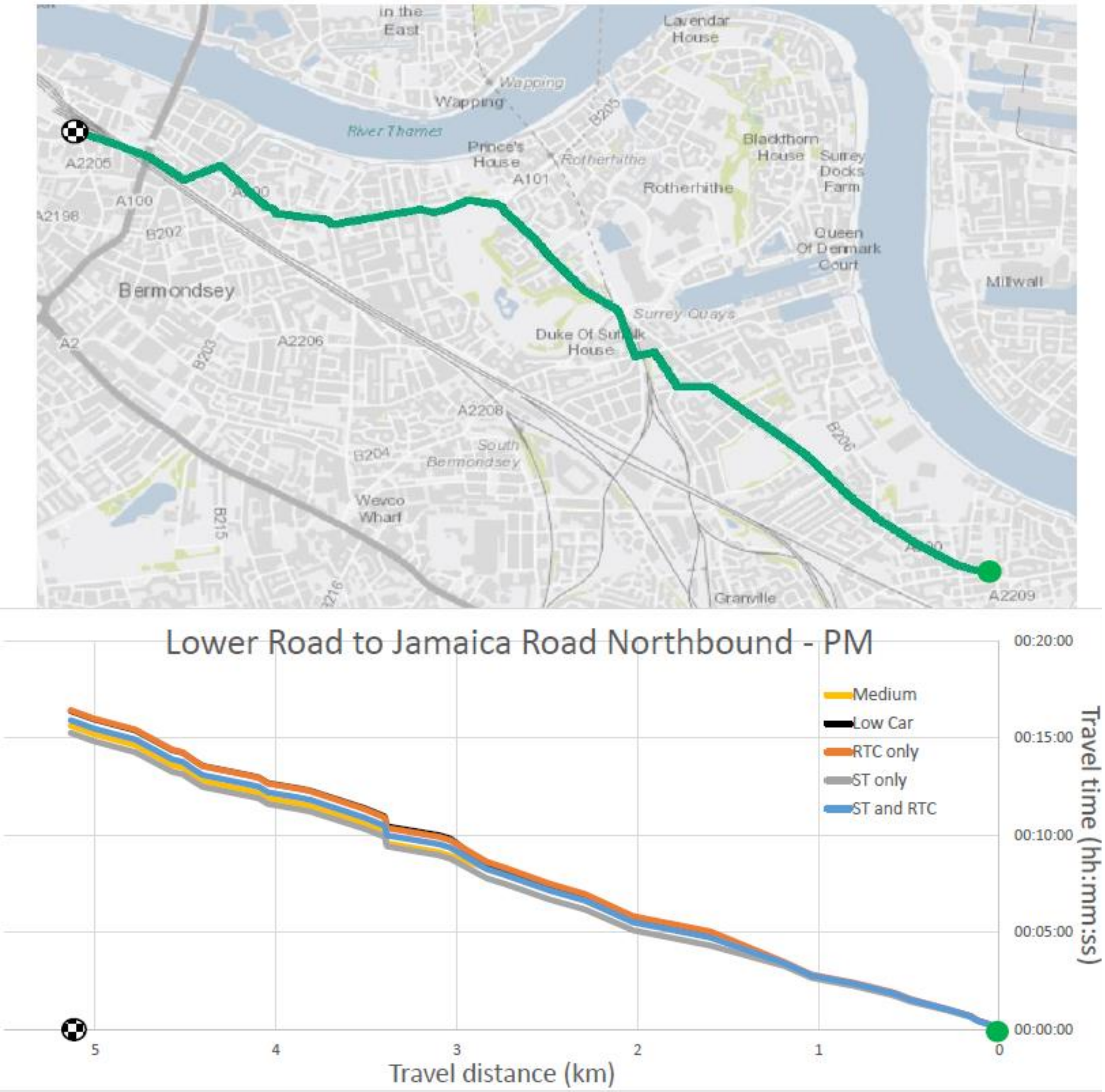
Source: River crossing flows_STintervention.xlsx

Overall, the Rotherhithe Tunnel charge has only a modest impact on demand at the Rotherhithe Tunnel, Silvertown Tunnel and Blackwall Tunnel. This is likely due to significant delay experienced on the approaches to these crossings, particularly the Blackwall and Silvertown Tunnels. As the cost of a journey when using the crossings is already significant in the assignment due to high levels of delay, the introduction of a physical cost i.e. a toll, is unlikely to have a significant percentage increase in the overall cost of the journey. Whilst the 'willingness to pay' the toll is considered in the model, the assignment shows a minimal effect, as shown in **Figure 119**.

An increase in the toll applied to the Rotherhithe Tunnel would have a larger impact on demand, but without testing this in both the LTS demand model and highway assignment model, the wider impacts could not be commented on. The wider impacts could include a mode shift, which might result from the inclusion of the toll in the LTS demand model, or the wider re-assignment of journeys on to other routes, which would be apparent from running the highway assignment model with the inclusion of the higher toll.

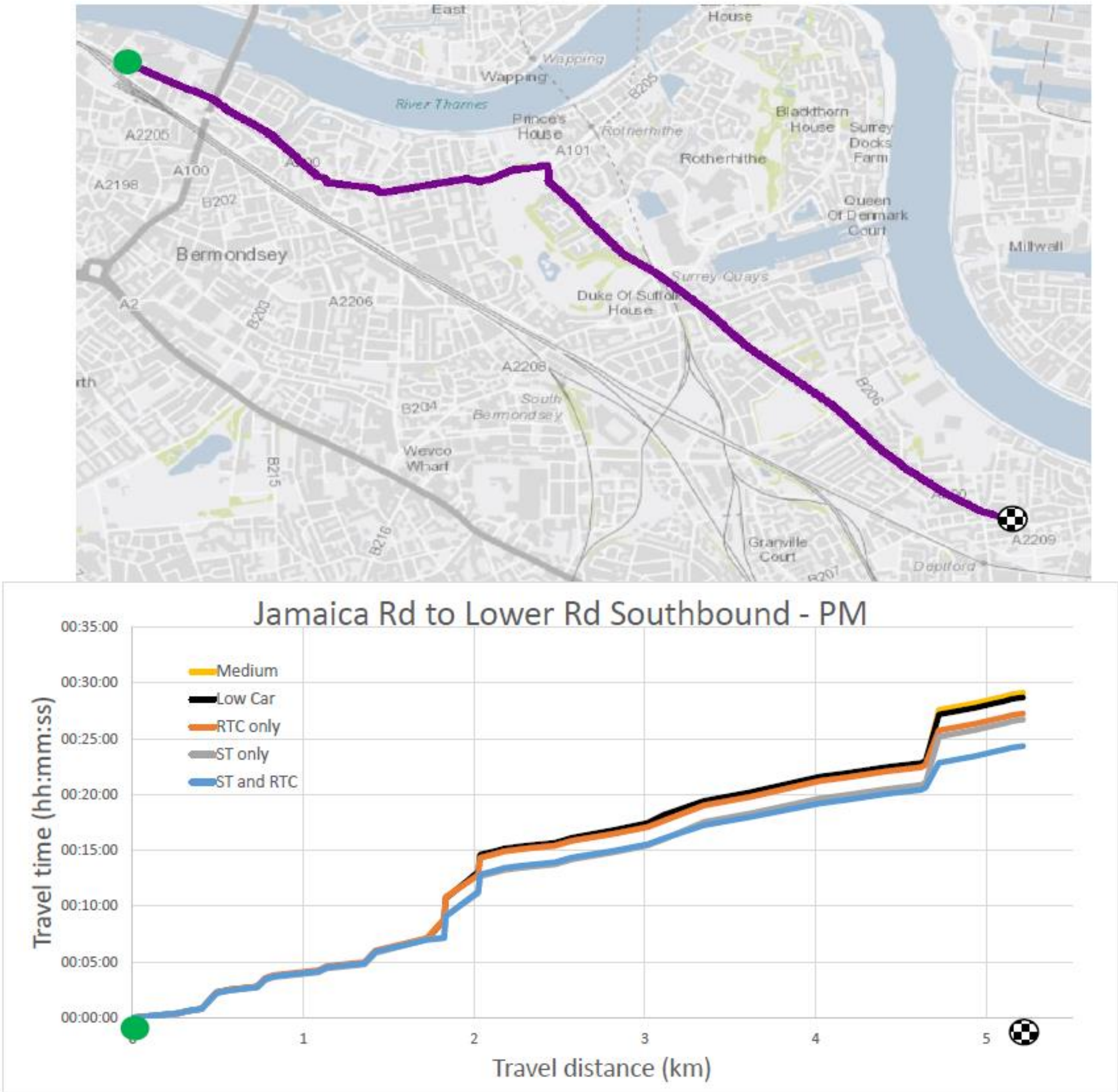
Figure 108 and **Figure 109** below indicate how the minor changes in demand as a result of the combinations of Silvertown Tunnel and the Rotherhithe Tunnel charge affect the journey times of traffic along Lower Road and Jamaica Road.

Figure 120: Journey times from Lower Road to Jamaica Road Northbound



Source: CW Journey Times_PM_v4_Interventions.xlsx

Figure 121: Journey times from Jamaica Road to Lower Road Southbound



Source: CW Journey Times_PM_v4_Interventions.xlsx

12 Intervention Package Testing

In Sections **10.1** and **10.2**, a series of independent rail and bus mitigations were tested to combat the areas of network stress and worsened transport conditions arising from the additional development at Canada Water. Subsequently, three packages of mitigation tests have been devised to assess the level of transport intervention required to sustain the Medium level development at Canada Water in the future:

1. 2031 AM Strategic "Lite" package without BLE, based on the 2031 AM Medium NTU Development scenario – no LTS demand response, Railplan assignment only.
2. 2031 AM Strategic "Lite" package with BLE, based on the 2031 AM Medium NTU Development scenario – LTS demand response followed by Railplan assignment.
3. 2041 AM Strategic "Full" package, based on the 2031 AM Medium Development scenario – LTS demand response followed by Railplan assignment.

The Strategic Lite packages represent reasonably foreseeable unfunded and uncommitted schemes which can be used to mitigate the proposed Canada Water development. The Strategic Full package represents a high scenario with maximum-possible transport schemes to serve a 2041 Max Growth scenario, incorporating the highest level of development across London.

The list of transport schemes included in each of the packages is shown in the following table.

Table 35: PT Mitigation Packages Specification

	2031 Do Minimum	2031 NTU Do Minimum	2031 AM Strategic Lite	2031 AM Strategic Lite with BLE	2041 AM Strategic Full
Matrix Total	3,396,452	3,396,452	3,403,368	3,405,756	3,832,422
Bus package	"Main"	"Main"	"Main"	"Main"	"Main"
Northern Line frequency	63tph	44tph	As per NTU test	As per NTU test	As per Do-Min
Jubilee Line frequency	34tph	32tph	As per NTU test (32tph)	As per NTU test (32tph)	36tph & New rolling stock
Elizabeth Line frequency	24tph	24tph	As per Do-Min (24tph)	As per Do-Min (24tph)	32tph
ELL frequency	16tph	16tph	20tph	20tph	24tph
DLR frequency	30tph	30tph	30tph	30tph	30tph
Shadwell interchange	No	No	Enhanced interchange	Enhanced interchange	Enhanced interchange
Crossrail 2	No	No	No	No	Yes
Bakerloo Line Extension	No	No	No	Yes	Yes
Brimmington Park station	No	No	No	No	Yes
Surrey Quays Northern entrance	No	No	Yes (additional to existing entrance)	Yes (additional to existing entrance)	Yes (additional to existing entrance)
LTS Demand Model Run?	***Yes***	***No***	***No***	***Yes***	***Yes***

The 'Strategic Lite with BLE' and 'Strategic Full' packages have been run through LTS to assess the mode choice, trip generation and trip distribution impacts..

It should be noted that the package tests affect transport supply only, land use and other demand drivers are unchanged from the Medium Development scenario. As such, the impacts we observe will be the result of mode shift and trip generation relative to the effects of the transport interventions.

As outlined in Section 4.1, the impacts on trip making for each mode as forecast by LTS have then been tested in the assignment models to gather a detailed view on their effectiveness at a local and strategic level, the results of which are shown in **Sections 12.2** and **12.3**.

12.1 Intervention Packages LTS Transport Inputs

12.1.1 2031 Strategic Lite

Table 36: Summary of transport schemes included in 2031 Strategic Lite LTS run

	MP	IP	EP
Bus package	"Main"	"Main"	"Main"
Northern Line frequency	As per NTU test	As per NTU test	As per NTU test
Jubilee Line frequency	As per NTU test (32tph)	As per NTU test (32tph)	As per NTU test (32tph)
Elizabeth Line frequency	As per Do-Min (24tph)	As per Do-Min (24tph)	As per Do-Min (24tph)
ELL frequency	20tph	As per Do-Min (16tph)	20tph
DLR frequency	30tph	As per Do-Min	30tph
Shadwell interchange	Enhanced interchange	Enhanced interchange	Enhanced interchange
Crossrail 2	No	No	No
Bakerloo Line Extension	Yes	Yes	Yes
Brimmington Park station	No	No	No
Surrey Quays Northern entrance	Yes (additional to existing entrance)	Yes (additional to existing entrance)	Yes (additional to existing entrance)

All coding has been converted from the individual AM public transport intervention tests from Emme Railplan to Cube LTS, with adaptations made for the IP and PM periods where necessary. The only exception is for the Surrey Quays northern entrance, which is now additional to the existing station rather than a replacement. BLE coding has been obtained from Railplan run OK243.

12.1.2 2041 Strategic Full

Table 37: Summary of transport schemes included in 2041 Strategic Full LTS run

	MP	IP	EP
Bus package	"Main"	"Main"	"Main"
Northern Line frequency	As per Do-Min	As per Do-Min	As per Do-Min
Jubilee Line frequency	36tph & New rolling stock	As per NTU test (32tph)	36tph & New rolling stock
Elizabeth Line frequency	32tph	21.3tph	32tph
ELL frequency	24tph	As per Do-Min	24tph

	MP	IP	EP
DLR frequency	30tph	As per Do-Min	30tph
Shadwell interchange	Enhanced interchange	Enhanced interchange	Enhanced interchange
Crossrail 2	Yes	Yes	Yes
Bakerloo Line Extension	Yes	Yes	Yes
Brimmington Park station	Yes	Yes	Yes
Surrey Quays Northern entrance	Yes (additional to existing entrance)	Yes (additional to existing entrance)	Yes (additional to existing entrance)

Note that in the IP period, the reference case Jubilee and Elizabeth Line frequencies are lower than those in the MP/EP; therefore, 32tph NTU frequency has been used for the Jubilee Line rather than 36tph, and 21.3tph (a proportional increase of 33% from 16tph) has been used for the Elizabeth Line. This has not been deemed to have any material effect, since only the peak period output matrices have been taken to assignment level.

Crossrail 2 coding has been obtained from Cube LTS run C7131XRLT.

12.2 Intervention Package Tests – Railpan Public Transport Impacts

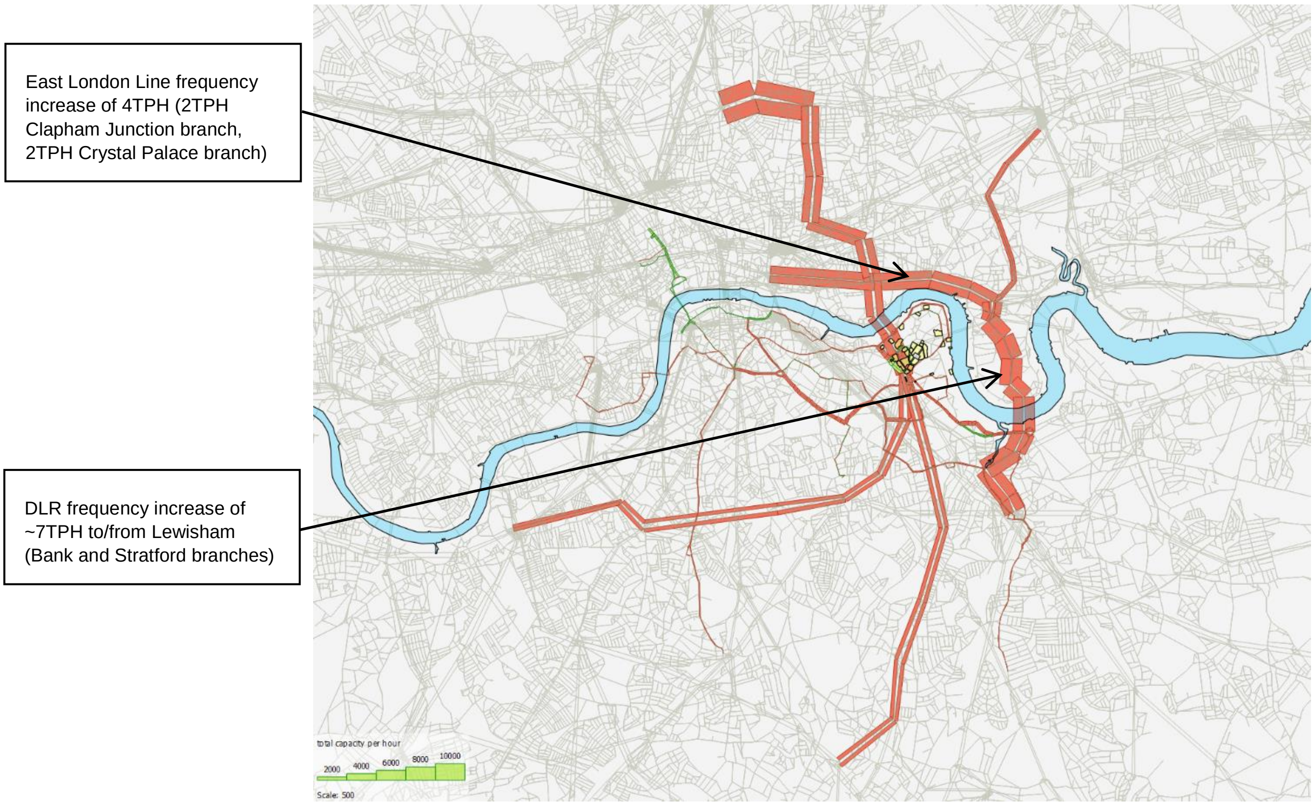
12.2.1 2031 AM Strategic Lite no BLE

Throughout this section, unless otherwise specified all comparisons are carried out against the Medium NTU (CQ516) scenario. Note that this test has been run in Railplan only using the same fixed demand matrix as the Medium Development scenario; an LTS run to calculate revised demadn has not been undertaken for this test.

12.2.1.1 Capacity changes

Figure 122 shows the main capacity changes between the two scenarios.

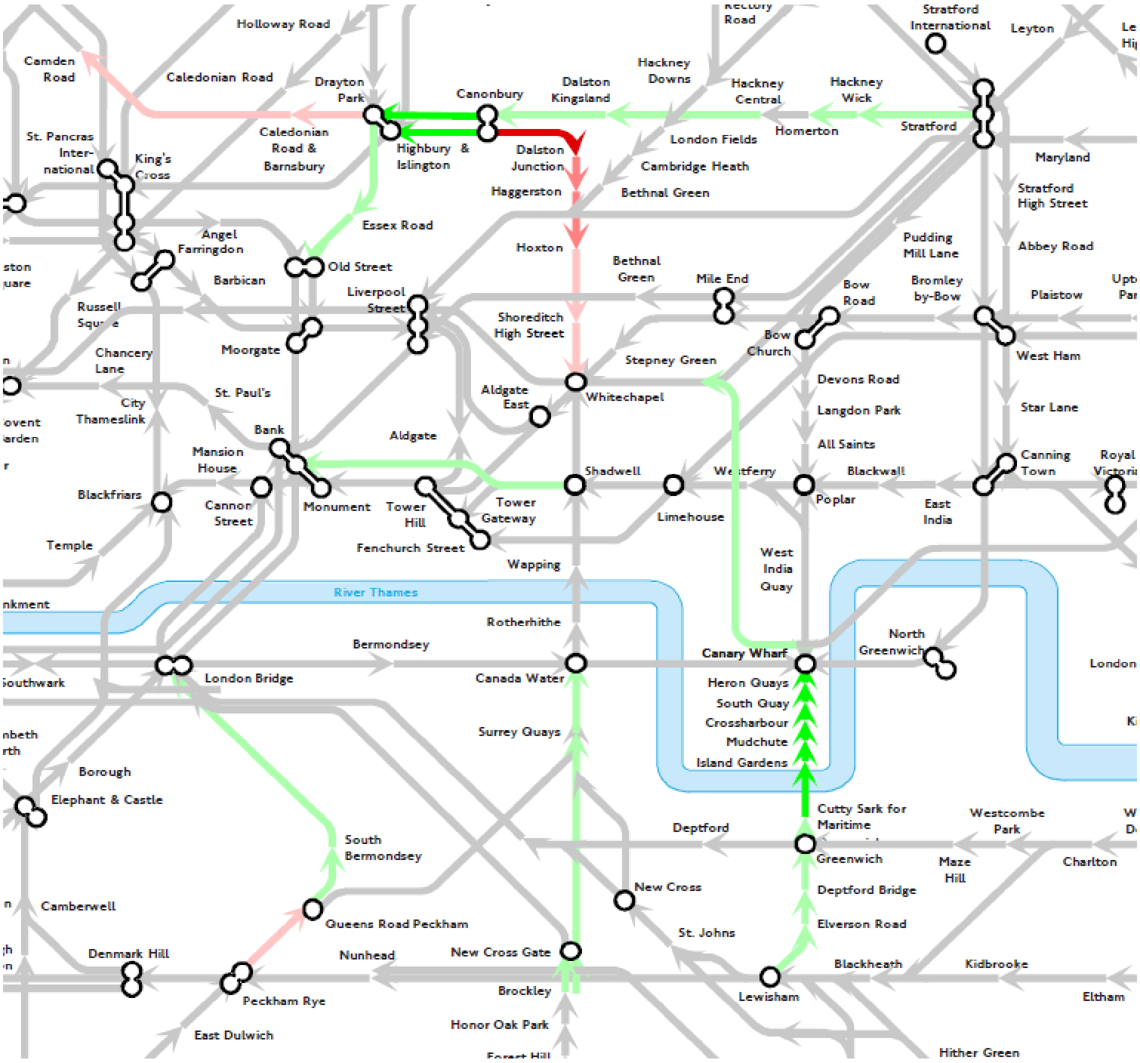
Figure 122: Summary of main capacity changes vs Medium NTU – Strategic Lite no BLE



12.2.1.2 Crowding impacts

Figure 123 shows the change in standing passengers per square metre. The ELL capacity increase alleviates crowding northbound via New Cross Gate, though Clapham Junction branch crowding increases marginally. There is decreased crowding between Canary Wharf and Lewisham as a result of the DLR frequency increase. We observe increased crowding southbound from Highbury & Islington due to the increased ELL frequency which allows for easier access to Crossrail at Whitechapel. It should be noted that the increase here is the largest on the network as it is a relative change to the Medium scenario, absolute crowding levels southbound on ELL are still relatively low at an absolute level.

Figure 123: Crowding impacts vs Medium BTU – Strategic Lite no BLE



12.2.1.3 Station movements

Figure 124 shows the absolute change in station movements at Canada Water. There is a reduction in Overground SB to Jubilee EB interchange as a result of Shadwell improvements. On the other hand, we see an increase in Overground NB to Jubilee EB interchange as a result of the ELL frequency increase. Overall there is a reduction of 4.4% in movements at Canada Water.

Figure 124: Change in station movements at Canada Water vs Medium NTU – Strategic Lite no BLE

CANADA WATER	Station Ent. 1	Overground NB	Overground SB	Jubilee Line WB	Jubilee Line EB	TOTAL
Station Ent. 1	0	72	0	212	-115	169
Overground NB	6	0	0	-145	350	211
Overground SB	-396	0	0	81	-846	-1,161
Jubilee Line WB	-218	-30	57	0	0	-191
Jubilee Line EB	-362	-14	-47	0	0	-423
TOTAL	-970	28	10	148	-611	-1,395

Figure 125 and **Figure 126** show change in station movements at Surrey Quays and Rotherhithe respectively. The second station entrance at Surrey Quays caters for a small number of entries from the development area, but more importantly serves the vast majority of Overground SB alighters, including around 400 trips who were using Canada Water. Rotherhithe sees a notable increase in station entries and exits for its relatively small flows.

Figure 125: Change in station movements at Surrey Quays vs Medium NTU – Strategic Lite no BLE

SURREY QUAYS	Station Ent.1	Station Ent.2	Overground NB	Overground SB	TOTAL
Station Ent.1	0	0	148	-64	84
Station Ent.2	0	0	0	295	295
Overground NB	545	0	0	0	545
Overground SB	-2,075	3,278	0	0	1,203
TOTAL	-1,530	3,278	148	231	2,127

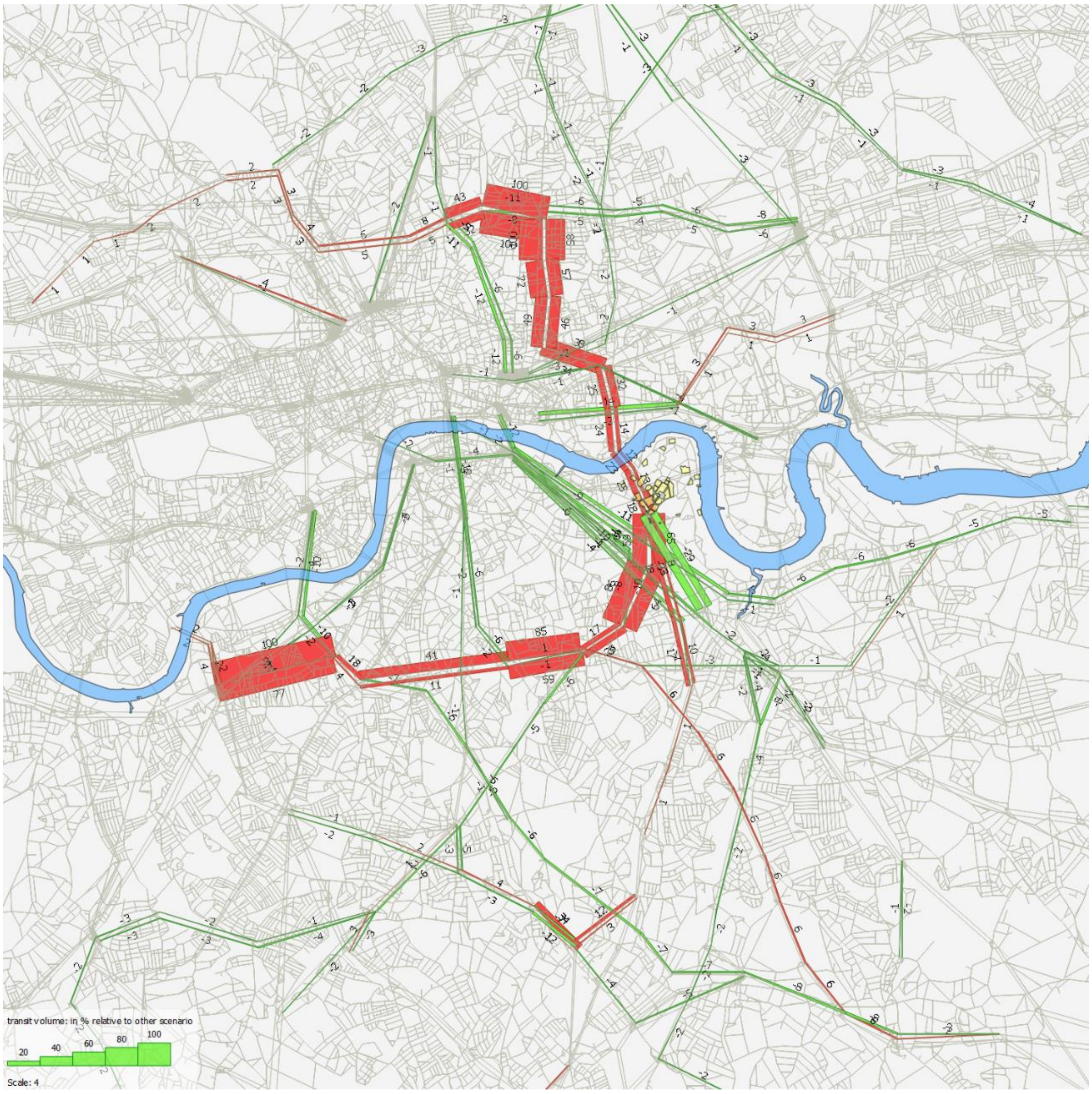
Figure 126: Change in station movements at Rotherhithe vs Medium NTU – Strategic Lite no BLE

ROTHERHITHE	Station Ent.1	Overground NB	Overground SB	TOTAL
Station Ent.1	0	262	123	385
Overground NB	94	0	0	94
Overground SB	141	0	0	141
TOTAL	235	262	123	620

12.2.1.4 Passenger flow changes

The following diagrams show the percentage change in passenger flows on rail, underground, bus, and DLR.

Figure 127: Percentage change in rail passenger flows vs Medium NTU – Strategic Lite no BLE

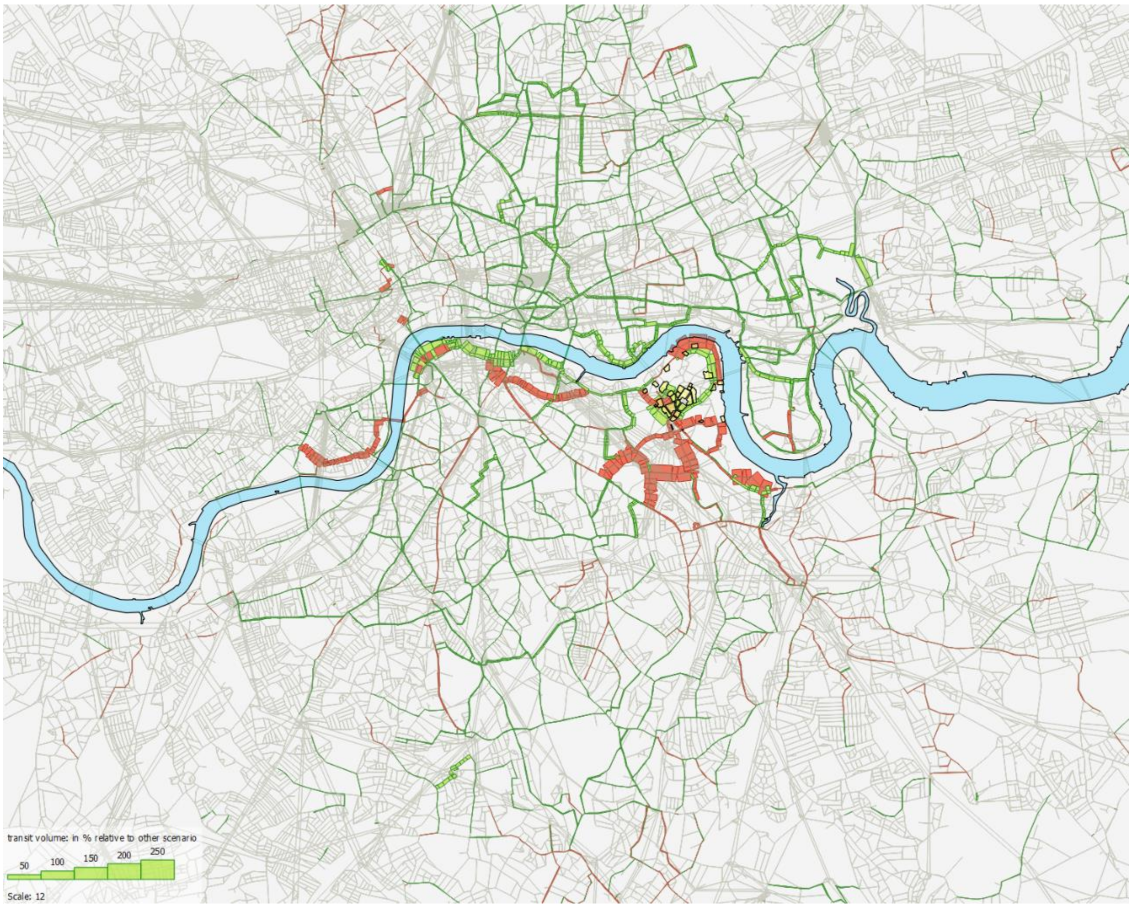


For rail, there is a significant increase in passengers on the Clapham Junction branch. There is also a large increase in use of ELL at New Cross Gate, instead of New Cross (which has no frequency change).

Figure 128: Percentage change in underground passenger flows vs Medium NTU – Strategic Lite no BLE

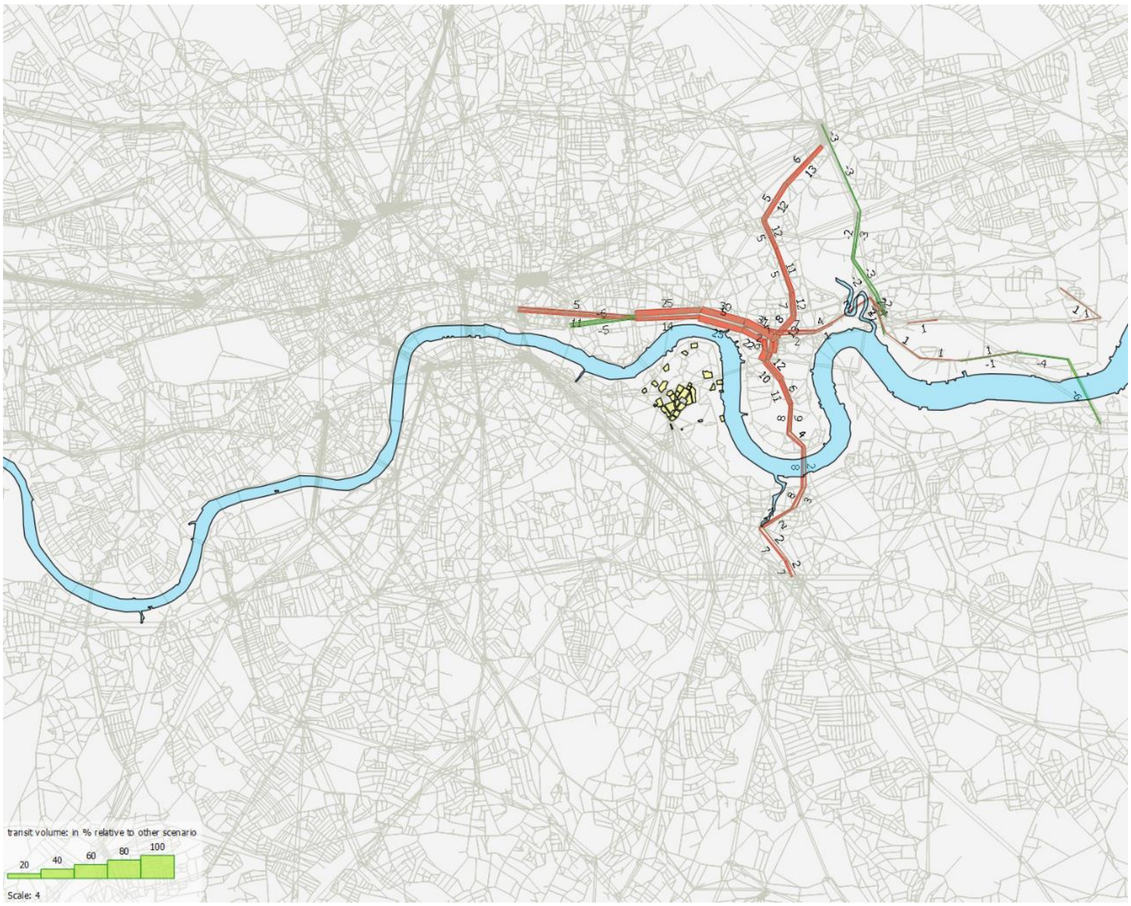
For underground, we see a small reduction in use of the Jubilee Line due to DLR and Shadwell improvements.

Figure 129: Percentage change in bus passenger flows vs Medium NTU – Strategic Lite no BLE



There are local changes around Canada Water and OKR as a result of the Main bus scheme.

Figure 130: Percentage change in DLR passenger flows vs Medium NTU – Strategic Lite no BLE



For DLR, there are notable increases in passengers in line with the Lewisham <> Bank/Stratford branch frequency increases.

12.2.1.5 Headline Impacts

- Main bus package – global decrease in passenger KM of 0.6%
- 20 tph East London Line – approximately +20% to +30% passenger flows on ELL via Canada Water, largest increases on Clapham Junction branch
- 30 tph DLR – approximately +10% passenger flows NB from Lewisham to Canary Wharf
- Shadwell interchange improvement – approximately +25% passenger flows EB towards Canary Wharf
- Second (additional) station entrance at Surrey Quays – approximately +30% station exits from NB ELL

12.2.2 2031 AM Strategic Lite with BLE

Throughout this section, unless otherwise specified all comparisons are carried out against the Medium NTU (CQ516) scenario. This test has been tests in LTS therefore the Railplan matrix assigned accounts for changes in demand as a result of the interventions included in this package.

Table 38 shows a summary of the changes arising from the impact of the Strategic Lite transport schemes.

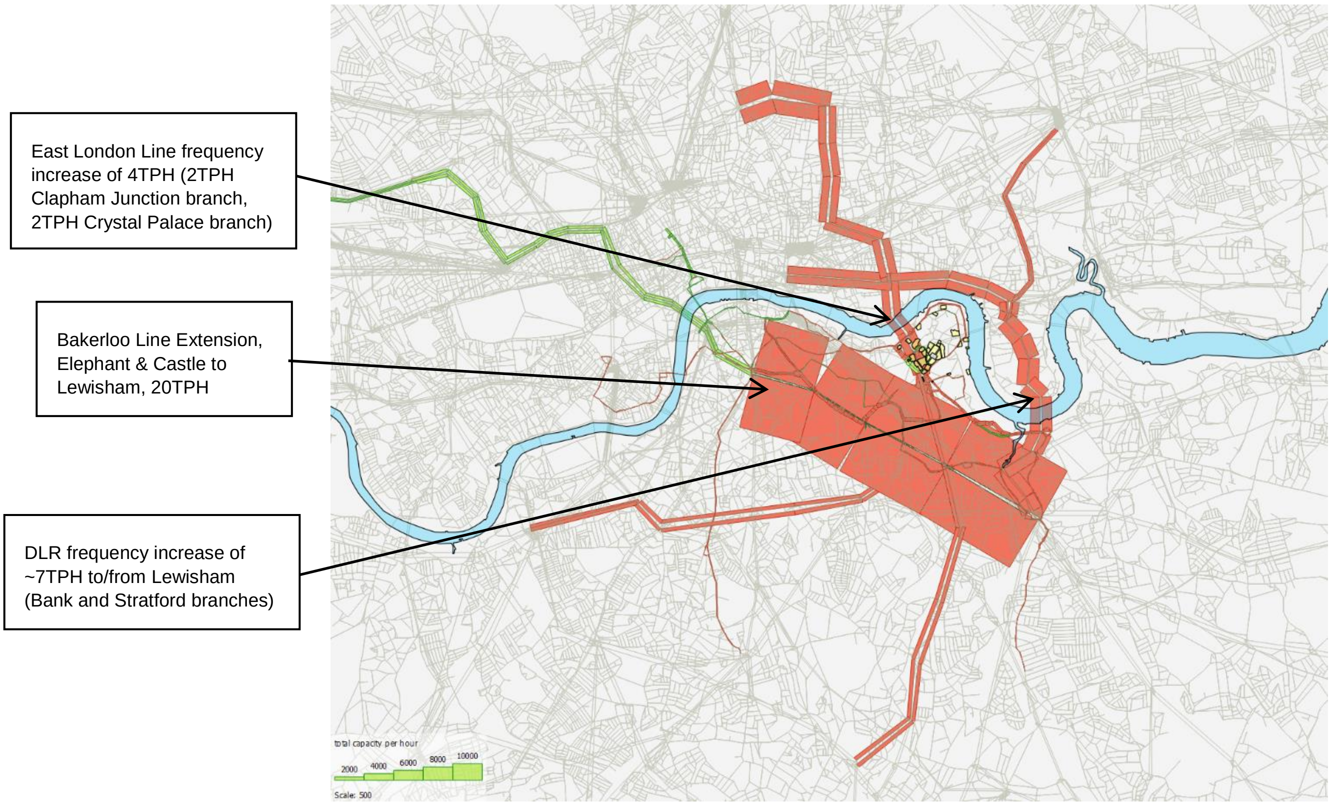
Table 38: Summary of changes – 2031 AM Medium Core vs Strategic Lite with BLE

	2031 AM Medium Core	2031 AM Strategic Lite with BLE
Railplan Scenario	**CQ516A312**	**CQ614A316**
Canada Water OA Development	Medium	Medium
Transport Interventions	None (NTU)	Strategic Lite inc. BLE (NTU)
Matrix Total	3,403,368	3,405,756
Transport Impact Trips Total		**2,388**
Rotherhithe Peninsula Transport Impact Trips		Origins = +390 Destinations = +890

12.2.2.1 Capacity changes

Figure 131 shows the main capacity changes between the two scenarios.

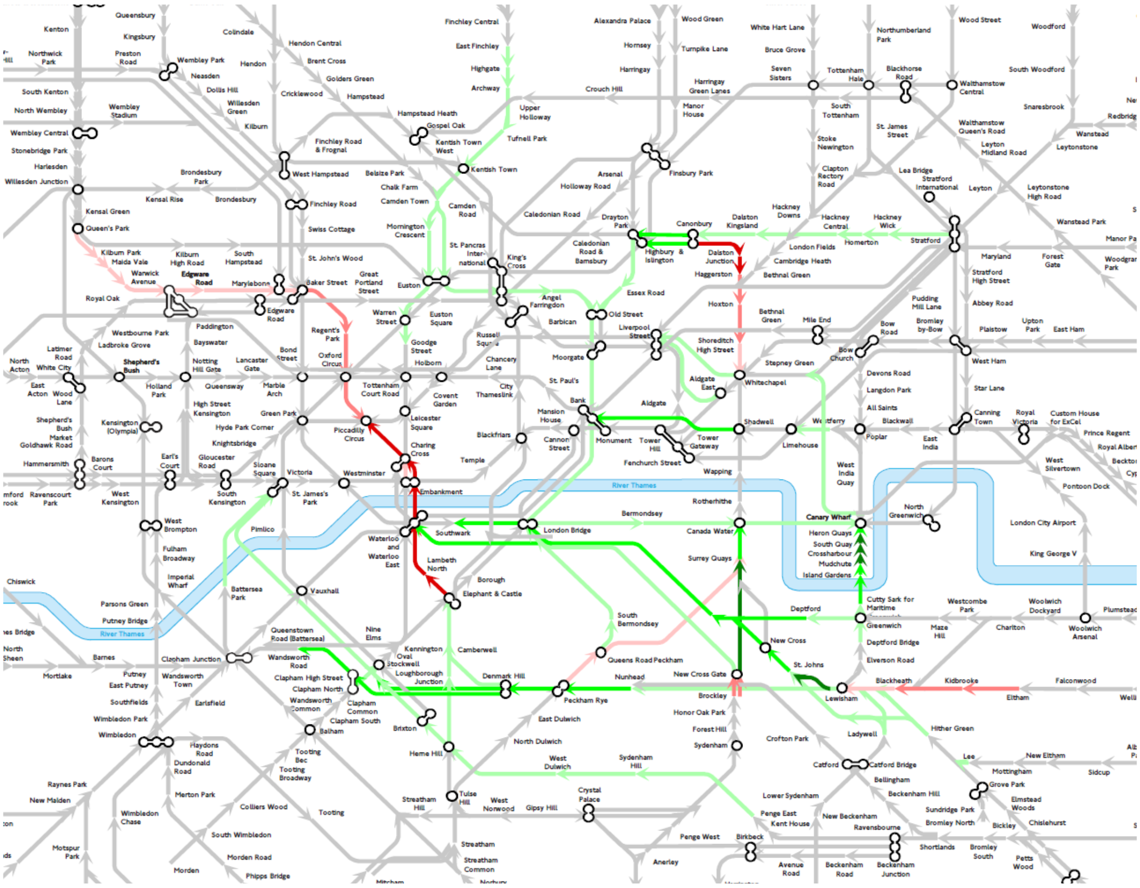
Figure 131: Summary of main capacity changes vs Medium NTU – Strategic Lite with BLE



12.2.2.2 Crowding impacts

Figure 132 shows the change in standing passengers per square metre. The Bakerloo Line is significantly more crowded due to extension demand. However, BLE offers interchange from ELL to Central London at New Cross Gate, alleviating crowding on the ELL and Jubilee Line. The ELL capacity increase significantly alleviates crowding except for the Clapham Junction branch, where crowding increases but from a significantly lower base level. We also see decreased crowding between Canary Wharf and Lewisham as a result of the DLR frequency increase, and general alleviation across Southern/SouthEastern lines as a result of BLE.

Figure 132: Crowding impacts vs Medium NTU – Strategic Lite with BLE



12.2.2.3 Station movements

Figure 133 shows the absolute change in station movements at Canada Water. There is significant reduction in Overground NB to Jubilee WB interchange due to BLE (since passengers can now interchange at New Cross Gate). There is also a reduction in Overground SB to Jubilee EB interchange as a result of Shadwell improvements. Conversely, we see an increase in Overground NB to Jubilee EB interchange as a result of the ELL frequency increase. Overall there is a reduction of 11.3% in movements at Canada Water.

Figure 133: Change in station movements at Canada Water vs Medium NTU – Strategic Lite with BLE

CANADA WATER	Station Ent. 1	Overground NB	Overground SB	Jubilee Line WB	Jubilee Line EB	TOTAL
Station Ent. 1	0	143	7	179	-131	198
Overground NB	22	0	0	-2,525	456	-2,047
Overground SB	-359	0	0	222	-852	-989
Jubilee Line WB	-258	-171	119	0	0	-310
Jubilee Line EB	-279	3	-193	0	0	-469
TOTAL	-874	-25	-67	-2,124	-527	-3,617

Figure 134 and **Figure 135** show change in station movements at Surrey Quays and Rotherhithe respectively. The results here are similar to the Strategic Lite no BLE test, with even more southbound alighters who were previously using Canada Water station.

Figure 134: Change in station movements at Surrey Quays vs Medium NTU – Strategic Lite with BLE

SURREY QUAYS	Station Ent.1	Station Ent.2	Overground NB	Overground SB	TOTAL
Station Ent.1	0	0	139	-24	115
Station Ent.2	0	0	0	350	350
Overground NB	1,018	0	0	0	1,018
Overground SB	-2,057	3,523	0	0	1,466
TOTAL	-1,039	3,523	139	326	2,949

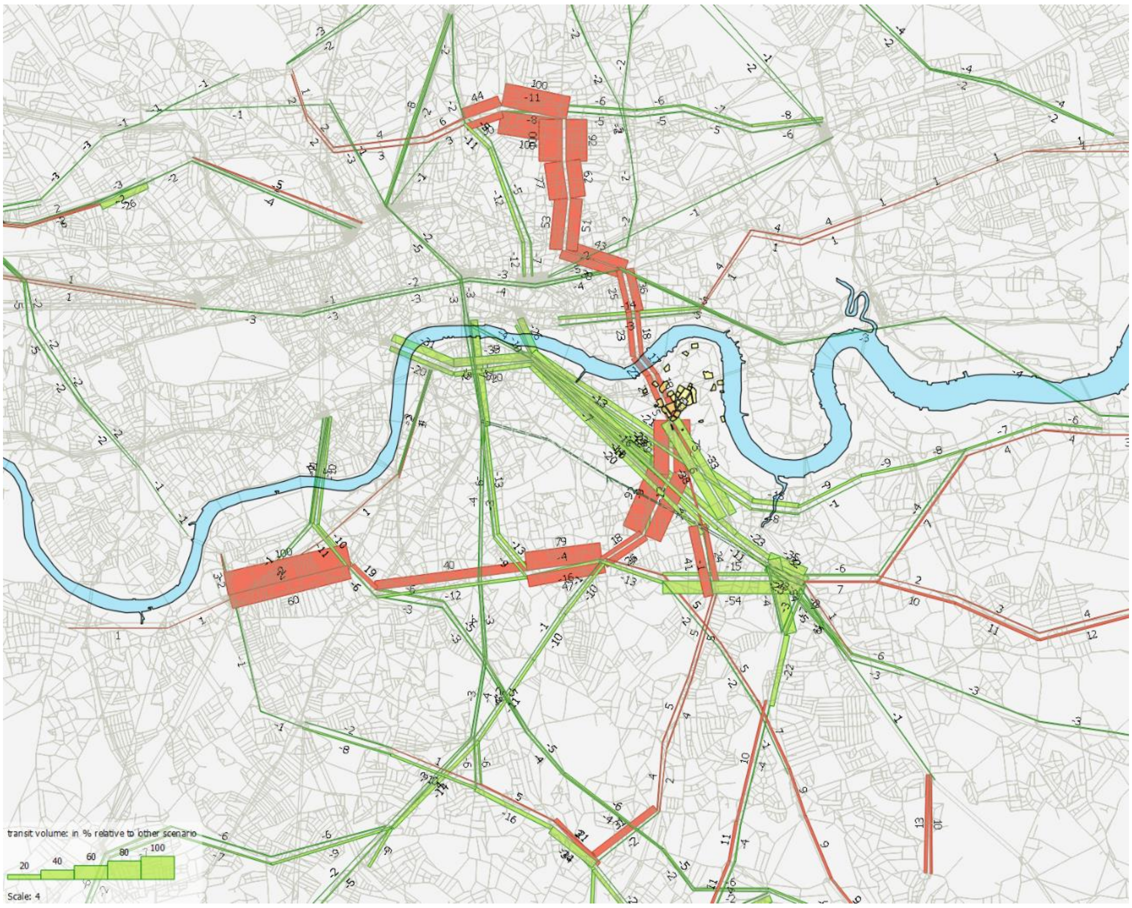
Figure 135: Change in station movements at Rotherhithe vs Medium NTU – Strategic Lite with BLE

ROTHERHITHE	Station Ent.1	Overground NB	Overground SB	TOTAL
Station Ent.1	0	283	197	480
Overground NB	135	0	0	135
Overground SB	162	0	0	162
TOTAL	297	283	197	777

12.2.2.4 Passenger flow changes

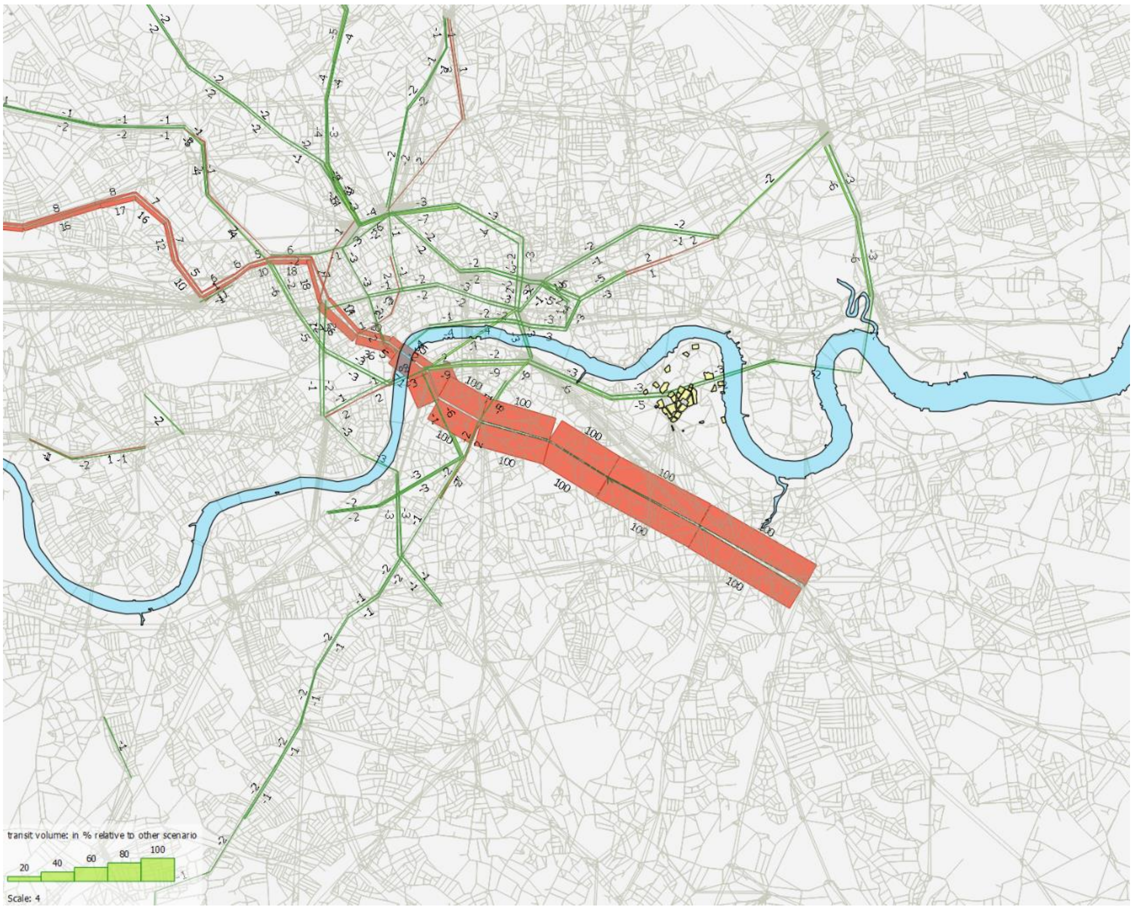
The following diagrams show the percentage change in passenger flows on rail, underground, bus, and DLR.

Figure 136: Percentage change in rail passenger flows vs Medium NTU – Strategic Lite with BLE



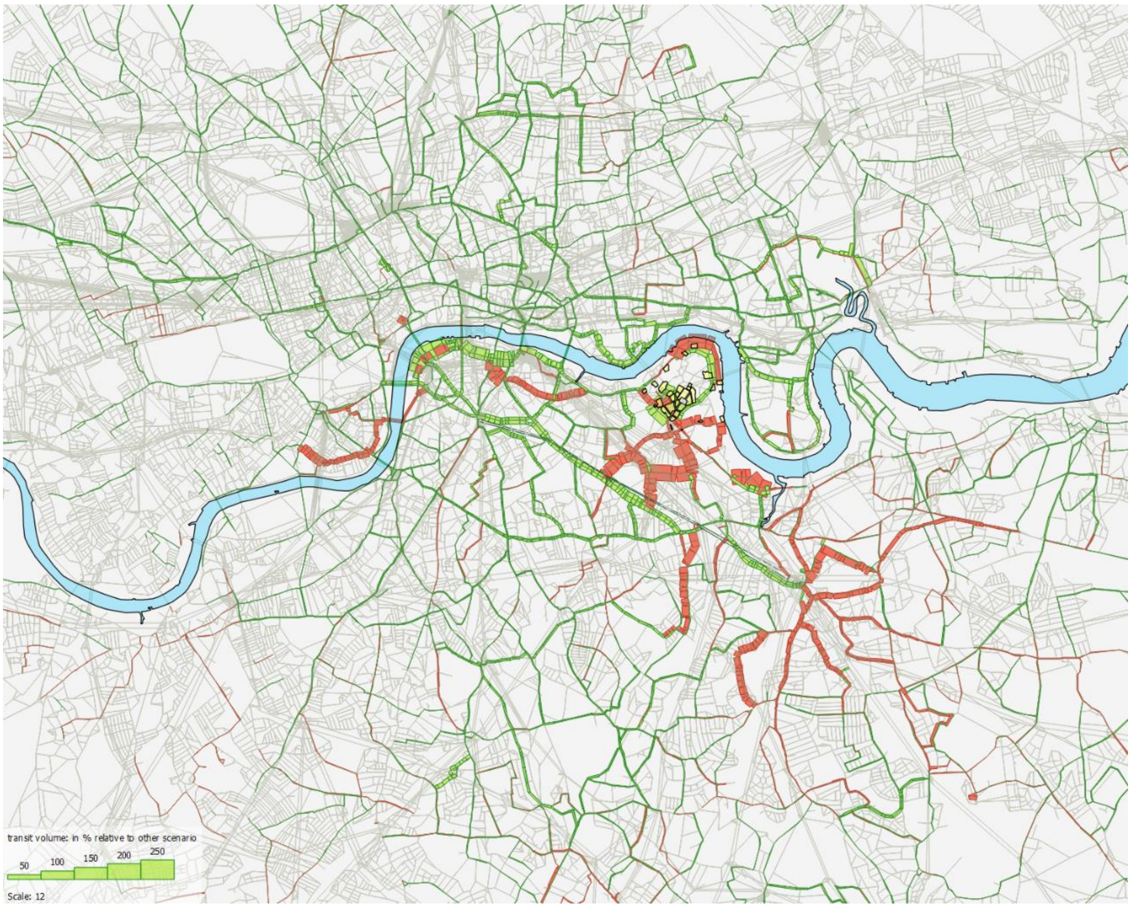
For rail, there is a significant increase in passengers on the Clapham Junction branch, as well as a large increase in use of ELL at New Cross Gate, instead of New Cross (which has no frequency change). We see an increase in passenger flows on the SouthEastern line to Lewisham to access BLE, but alleviation elsewhere as a result of the extension.

Figure 137: Percentage change in underground passenger flows vs Medium NTU – Strategic Lite with BLE



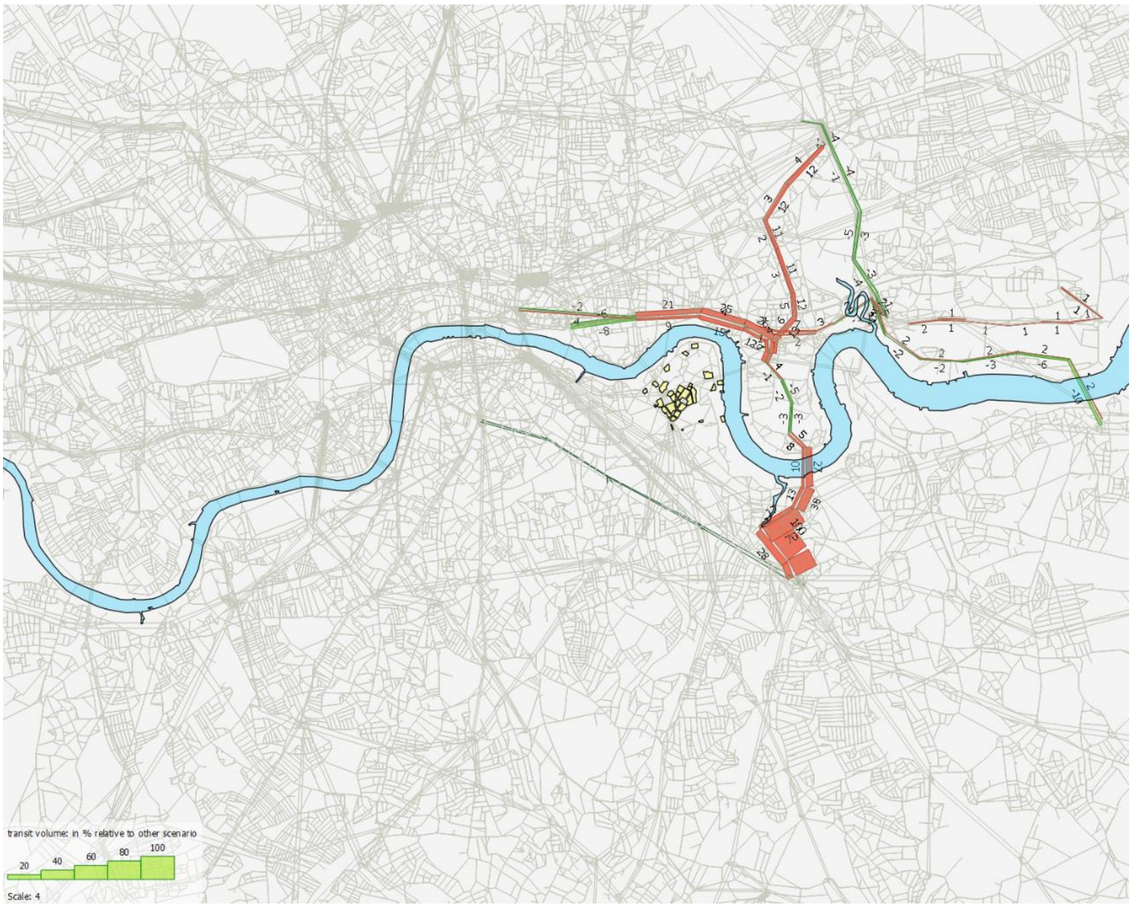
On underground there is an obvious increase across the Bakerloo line resulting from the extension. Some reduction in use of Jubilee Line; WB flow from Canada Water to London Bridge reduced by 9%.

Figure 138: Percentage change in bus passenger flows vs Medium NTU – Strategic Lite with BLE



There is a decrease in bus passengers from Lewisham to Elephant & Castle due to BLE, and local changes around Canada Water and OKR as a result of the Main bus scheme.

Figure 139: Percentage change in DLR passenger flows vs Medium NTU – Strategic Lite with BLE



For DLR, a notable increase in passengers in line with the Lewisham <> Bank/Stratford branch frequency increases, with a large increase southbound to access Bakerloo Line from Lewisham.

12.2.2.5 Headline impacts

- Bakerloo Line Extension – decrease in patronage on competing lines (Southern/SouthEastern/Jubilee) and modes (buses). Increase on lines accessing Lewisham (SouthEastern/DLR)
- Main bus package – global decrease in passenger KM of 1.7% due to Bakerloo Line Extension
- 20 tph East London Line – approximately +20% to +30% passenger flows on ELL via Canada Water, largest increases on Clapham Junction branch
- 30 tph DLR – approximately +20% passenger flows NB from Lewisham to Canary Wharf
- Shadwell interchange improvement – approximately +20% passenger flows EB towards Canary Wharf
- Second (additional) station entrance at Surrey Quays – approximately +30% station exits from NB ELL

12.2.3 2041 Strategic Full

Throughout this section, unless otherwise specified all comparisons are carried out against the Canada Water Max Growth (CQ522) scenario. This test has been tests in LTS therefore the Railplan matrix assigned accounts for changes in demand as a result of the interventions included in this package.

Table 39 shows a summary of the changes arising from the impact of the Strategic Full transport schemes.

Table 39: Summary of changes – 2041 AM Max Growth vs Strategic Full

	2041 AM Max Growth	2041 AM Strategic Full	
Railplan Scenario	**CQ522A412**	**CQ615A413**	
Canada Water OA Development	Medium	Medium	
Transport Interventions	None	Strategic Full	
Matrix Total	3,771,674	3,832,422	
Transport Impact Trips Total		**60,748**	
PT Mode Share Change (GLA)		+0.85%	
Rotherhithe Peninsula Transport Impact Trips		Origins = +650	Destinations = +1,200

The following diagrams show specifically the differences in origin and destination trip ends resulting from the transport schemes.

Figure 140: Change in origin trip ends – 2041 AM Max Growth vs Strategic Full

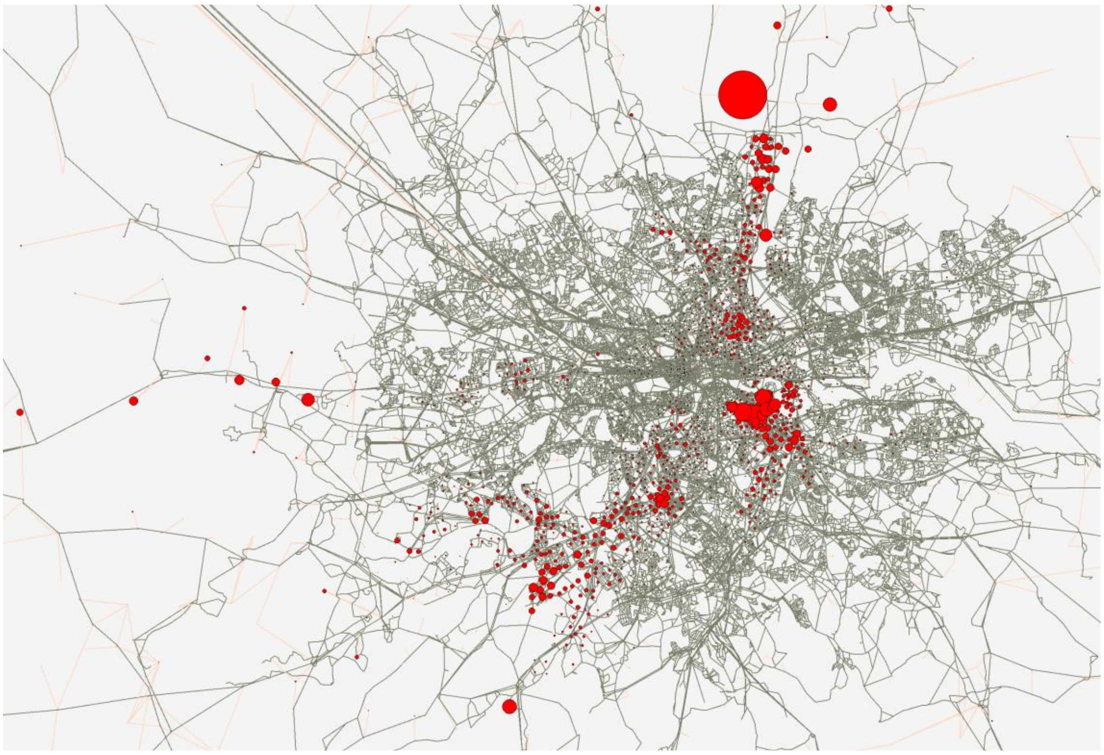
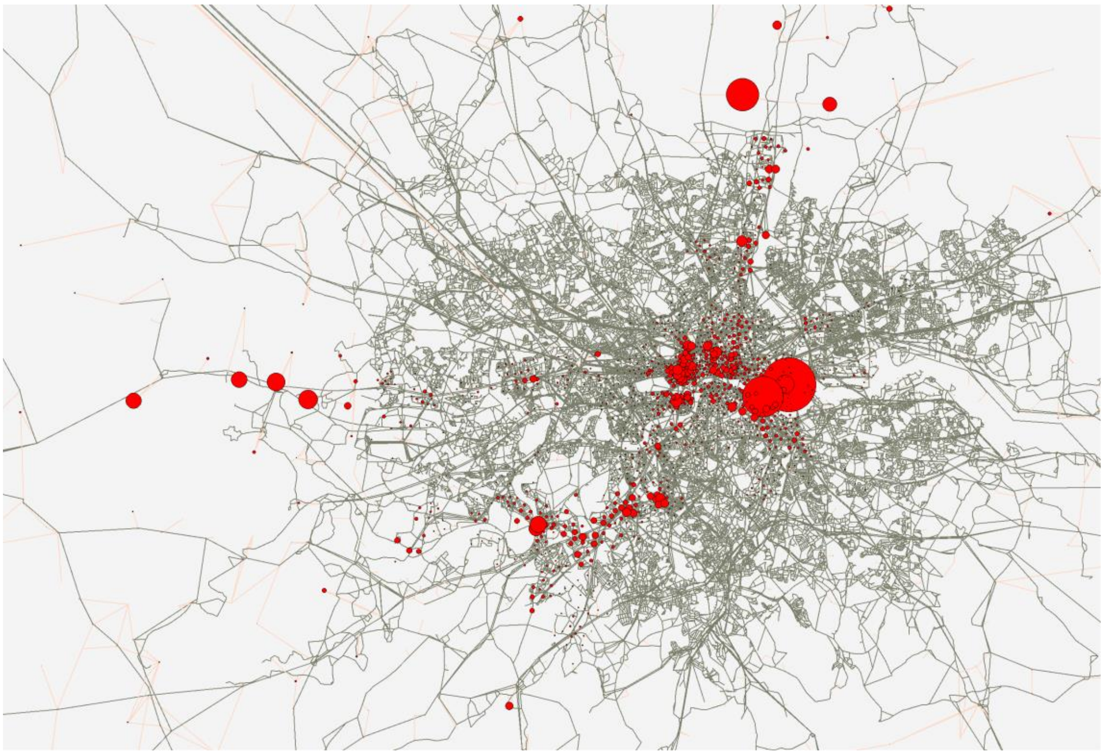


Figure 141: Change in destination trip ends – 2041 AM Max Growth vs Strategic Full



We see significant additional trip making to Canada Water. We also observe significant additional trip making in Lewisham and BLE corridor, as well as along the Elizabeth Line and Crossrail 2 corridors.

Figure 142: Change in destination trip ends at Canada Water and Isle of Dogs – 2041 AM Max Growth vs Strategic Full

Here we see the substantial increase in trip attractions to Canada Water and Canary Wharf due to the impact of the Strategic Full transport schemes. This is further highlighted in **Table 40** which shows 2041 growth aspirations for Opportunity Areas relevant to the Jubilee and ELL corridors, as well as their under-representation in the 2041 reference case.

Table 40: Growth area development in 2041 Max Growth

Growth area	2041 growth aspiration		Under-representation in 2041 Ref Case (added in Max Growth)	
	Population	Employment	Population	Employment
Canada Water	14,520	15,100	11,375	13,093
City Fringe / Tech City	19,140	70,000	-	-
Clapham Junction	5,500	-	-	-
Croydon	20,900	23,500	-	16,832
Deptford Creek / Greenwich Riverside	11,000	4,000	-	2,735
Greenwich Peninsula	44,000	7,000	21,319	3,374
Isle of Dogs	132,000	110,000	87,205	4,449

Growth area	2041 growth aspiration		Under-representation in 2041 Ref Case (added in Max Growth)	
Lewisham Catford & New Cross	17,600	6,000	-	-
London Bridge Borough & Bankside	4,180	25,000	-	-
Lower Lea Valley (incl Stratford)	75,900	52,000	-	4,998
Old Kent Road	44,000	5,000	39,114	2,488
Vauxhall Nine Elms & Battersea	44,000	25,000	4,869	5,734
Waterloo	5,500	15,000	164	-
Wembley	30,536	11,000	13,090	6,934
West Hampstead Interchange	1,760	100	974	-

Most notable is the population under-representation of almost 110,000 in the Greenwich Peninsula and Isle of Dogs areas. These two areas alone account for a quarter of the total increase across all growth areas in London.

As we will see later, this is a major factor for the increased crowding on Jubilee Westbound services through Canada Water in the 2041 max growth scenario.

12.2.3.1 Capacity changes

Figure 143 shows the main capacity changes between the Max Growth and Strategic Full scenarios.

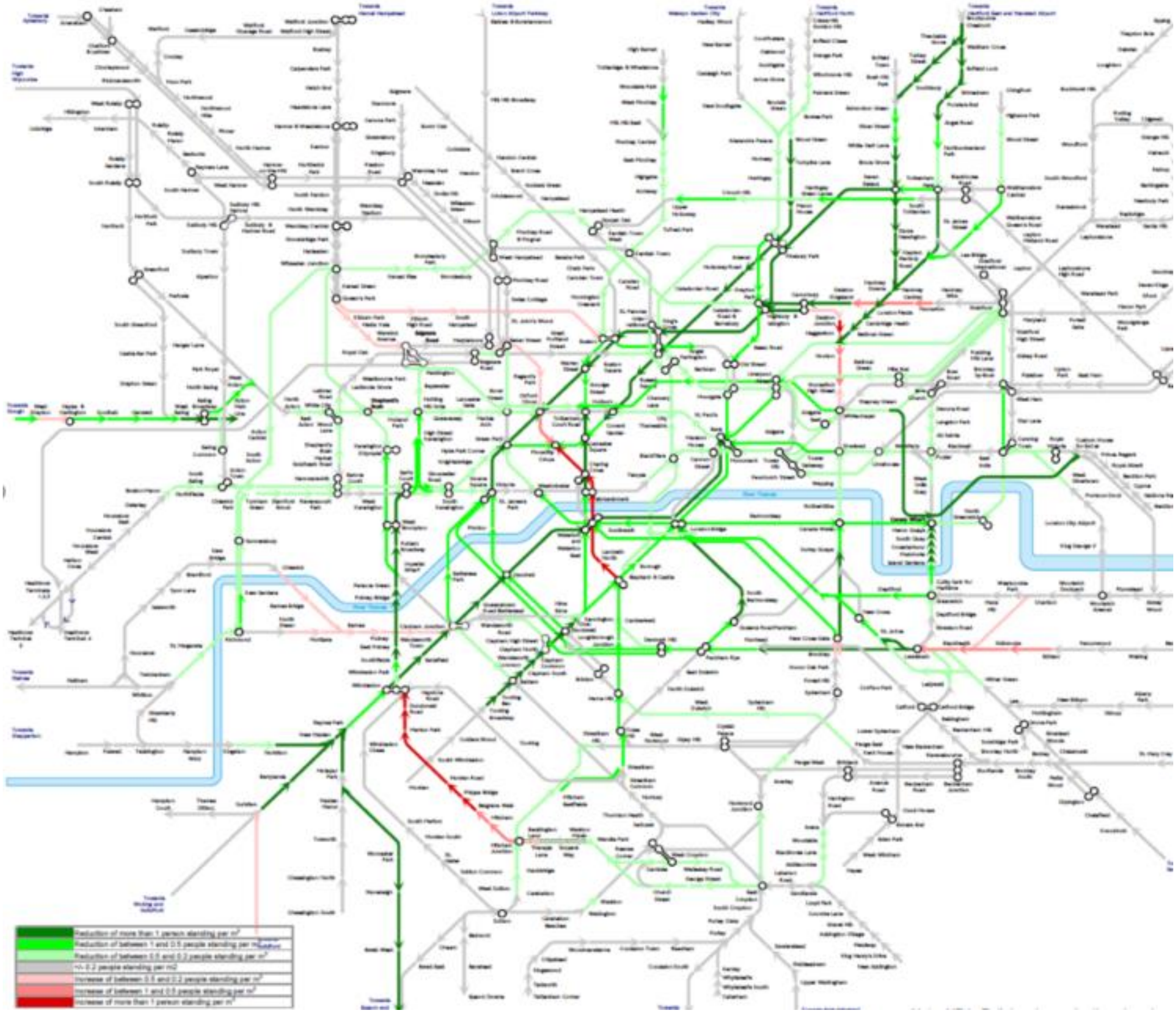
Figure 143: Summary of main capacity changes vs Max Growth – Strategic Full

12.2.3.2 Crowding impacts

Figure 144 shows the change in standing passengers per square metre. We see widespread crowding alleviation as a result of the Elizabeth Line frequency increase and introduction of Crossrail 2.

On the other hand, the Bakerloo Line is significantly more crowded due to extension demand. There is also increased crowding on arrival at Lewisham on SouthEastern services due to BLE. Furthermore, we see a significant increase in crowding on trams to access Crossrail 2 at Wimbledon, as well as a moderate increase in crowding around the Canonbury area due to increased ELL frequency.

Figure 144: Crowding impacts vs Max Growth – Strategic Full



The following tables show the absolute crowding on the Jubilee line across all of the mitigation packages, as well as the change in crowding when compared with the Do-Minimum NTU scenario.

Table 41: Absolute crowding (standing pax/sqm) – Jubilee Eastbound

Eastbound	Bermondsey > Canada Water	Canada Water > Canary Wharf
2031 AM Do-Minimum NTU	**5.2**	**5.62**
2031 AM Medium NTU	**5.44**	**5.57**
2031 AM Strategic Lite (no BLE)	**5.27**	**5.38**
2031 AM Strategic Lite (with BLE)	**5.22**	**5.35**
2041 AM Max Growth	**5.73**	**6.02**
2041 AM Strategic Full	**4.95**	**5.3**

Table 42: Change in crowding vs Do-Minimum NTU – Jubilee Eastbound

	Bermondsey > Canada Water	Canada Water > Canary Wharf
2031 AM Do-Minimum NTU	**0**	**0**
2031 AM Medium NTU	**0.24**	**-0.05**
2031 AM Strategic Lite (no BLE)	**0.07**	**-0.25**
2031 AM Strategic Lite (with BLE)	**0.03**	**-0.27**
2041 AM Max Growth	**0.54**	**0.4**
2041 AM Strategic Full	**-0.24**	**-0.33**

Table 43: Absolute crowding (standing pax/sqm) – Jubilee Westbound

	Canary Wharf > Canada Water	Canada Water > Bermondsey
2031 AM Do-Minimum NTU	**3.11**	**4.36**
2031 AM Medium NTU	**3.23**	**4.4**
2031 AM Strategic Lite (no BLE)	**3.16**	**4.38**
2031 AM Strategic Lite (with BLE)	**3.15**	**4.09**
2041 AM Max Growth	**4.69**	**5.69**
2041 AM Strategic Full	**4.18**	**4.93**

Table 44: Change in crowding vs Do-Minimum NTU – Jubilee Westbound

	Canary Wharf > Canada Water	Canada Water > Bermondsey
2031 AM Do-Minimum NTU		
2031 AM Medium NTU	**0.12**	**0.05**
2031 AM Strategic Lite (no BLE)	**0.06**	**0.02**
2031 AM Strategic Lite (with BLE)	**0.05**	**-0.26**
2041 AM Max Growth	**1.58**	**1.34**
2041 AM Strategic Full	**1.08**	**0.57**

The major increase in crowding on Westbound services is due mainly to the population increase of 110,000 in Greenwich Peninsula and Isle of Dogs in the max growth scenario.

It has been found that present day WB model flows are typically under-represented compared with observed data. However, the Canada Water base year model (CQ114) validates within 5% of observed data. This suggests that the increase in crowding in 2041 is due more so because of the population jump, and less so because of any potential under-representation in the 2031 forecasts

12.2.3.3 Station movements

Figure 145 shows the absolute change in station movements at Canada Water. There is significant reduction in Overground NB to Jubilee WB interchange due to BLE (since passengers can now interchange at New Cross Gate). There is also a reduction in Overground SB to Jubilee EB interchange as a result of Shadwell improvements.

Conversely, we see an increase in Overground NB to Jubilee EB interchange as a result of the ELL and Jubilee line frequency increases (2031 Strategic Lite saw a smaller impact solely from the ELL change of 350 without BLE and ~450 with BLE). There is also Increased use of Overground northbound as a result of trip end increase/redistribution to/from areas such as Dalston and Whitechapel.

Overall there is a reduction of 3.9% in movements at Canada Water

Figure 145: Change in station movements at Canada Water vs Max Growth – Strategic Full

CANADA WATER	Station Ent. 1	Overground NB	Overground SB	Jubilee Line WB	Jubilee Line EB	TOTAL
Station Ent. 1	0	338	17	143	-498	0
Overground NB	23	0	0	-2,143	1,975	-145
Overground SB	-523	0	0	153	-885	-1,255
Jubilee Line WB	-516	258	209	0	0	-49
Jubilee Line EB	37	143	-146	0	0	34
TOTAL	-979	739	80	-1,847	592	-1,415

Table 45 and **Table 46** show the interchange from Overground to Jubilee line across all mitigation packages.

Table 45: Overground to Jubilee Line interchange at Canada Water - Eastbound

Eastbound	OV > JB EB	Change vs DM (Abs)	Change vs DM (%)
2031 AM Do-Minimum NTU	4,791	0	0%
2031 AM Medium NTU	4,698	-93	-2%
2031 AM Strategic Lite (no BLE)	4,202	-589	-14%
2031 AM Strategic Lite (with BLE)	4,302	-489	-11%
2041 AM Max Growth	5,790	999	17%
2041 AM Strategic Full	6,880	2,089	30%

Table 46: Overground to Jubilee Line interchange at Canada Water – Eastbound

Westbound	OV > JB WB	Change vs DM (Abs)	Change vs DM (%)
2031 AM Do-Minimum NTU	5344	0	0%
2031 AM Medium NTU	5045	-299	-6%
2031 AM Strategic Lite (no BLE)	4981	-363	-7%
2031 AM Strategic Lite (with BLE)	2742	-2602	-95%
2041 AM Max Growth	5120	-224	-4%
2041 AM Strategic Full	3130	-2214	-71%

For Eastbound movements, growth in Isle of Dogs and Stratford in the Max Growth has significant impact. For the Westbound, Max Growth has less impact, but BLE plays a large role in reducing movements.

Figure 146 and **Figure 147** show change in station movements at Surrey Quays and Rotherhithe respectively. The second station entrance at Surrey Quays caters for a small number of entries from the development area, but more importantly serves the vast majority of Overground SB alighters, including around 500 trips who were using Canada Water. There is an overall increase of 42.9% in movements at Surrey Quays. Rotherhithe sees a notable increase in station entries and exits for its relatively small flows.

Figure 146: Change in station movements at Surrey Quays vs Max Growth – Strategic Full

SURREY QUAYS	Station Ent.1	Station Ent.2	Overground NB	Overground SB	TOTAL
Station Ent.1	0	0	148	-64	84
Station Ent.2	0	0	0	295	295
Overground NB	545	0	0	0	545
Overground SB	-2,075	3,278	0	0	1,203
TOTAL	-1,530	3,278	148	231	2,127

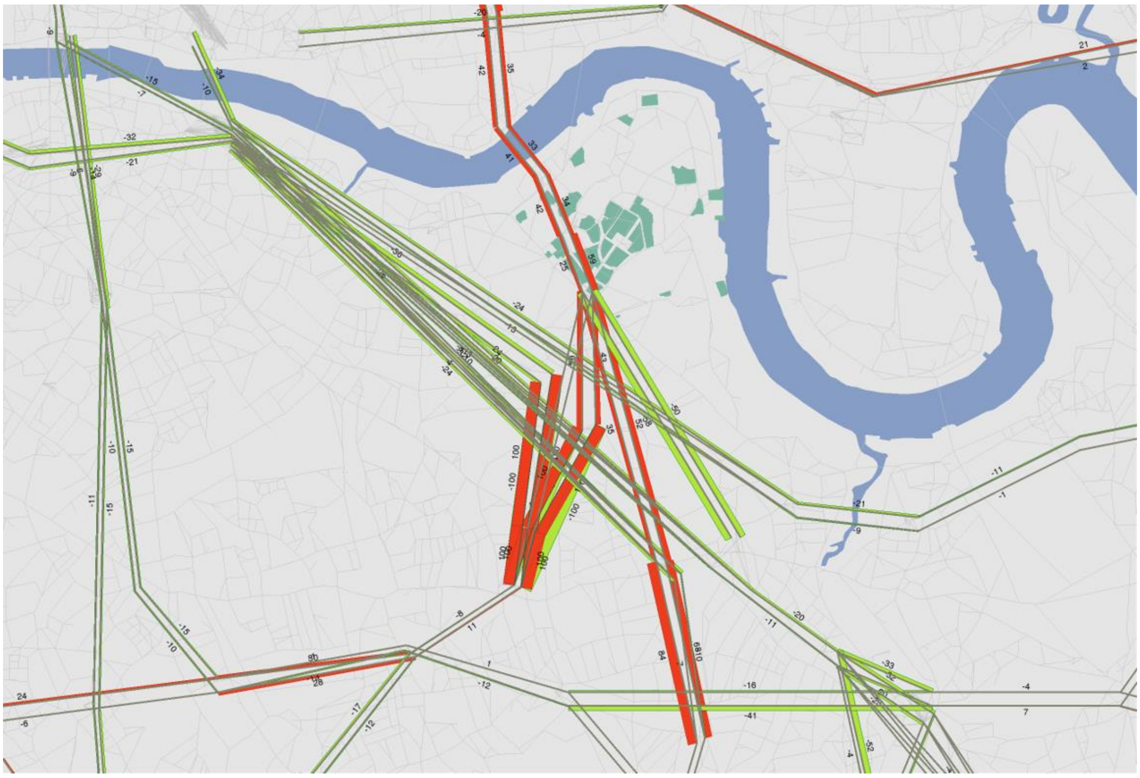
Figure 147: Change in station movements at Rotherhithe vs Max Growth – Strategic Full

ROTHERHITHE	Station Ent.1	Overground NB	Overground SB	TOTAL
Station Ent.1	0	262	123	385
Overground NB	94	0	0	94
Overground SB	141	0	0	141
TOTAL	235	262	123	620

12.2.3.4 Passenger flow differences

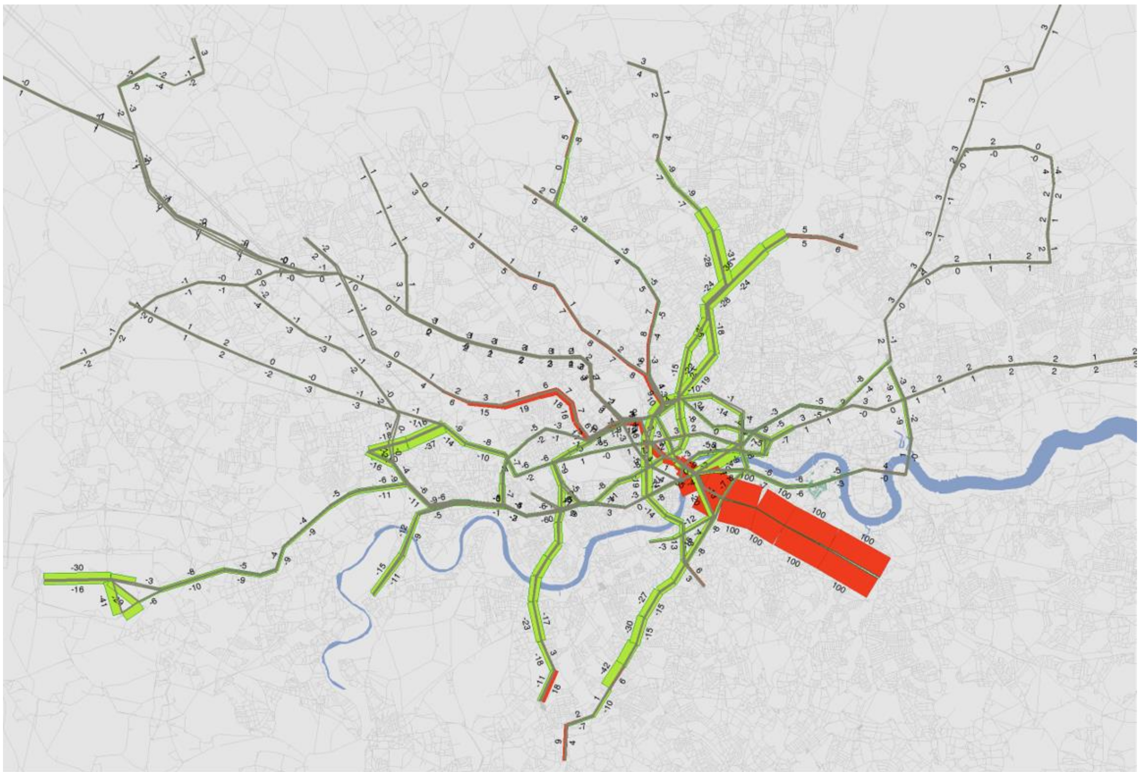
The following diagrams show the percentage change in passenger flows on rail, underground, bus, and DLR.

Figure 148: Percentage change in rail passenger flows vs Max Growth – Strategic Full



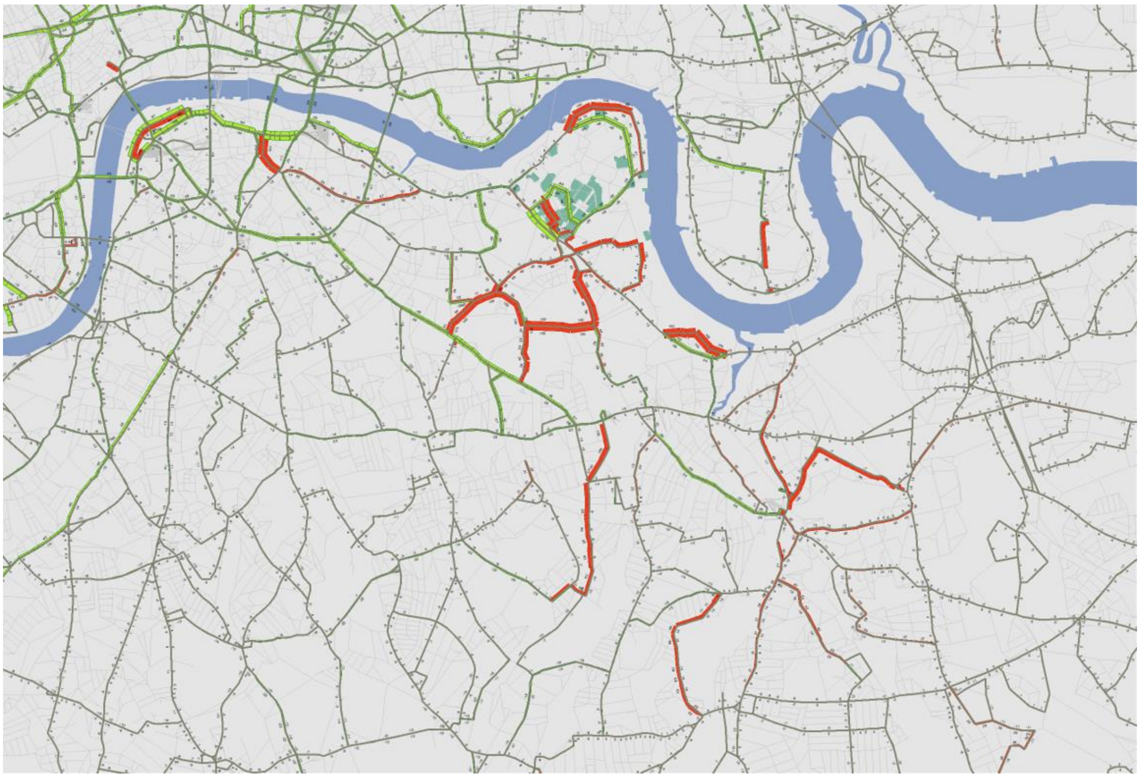
For rail there is a significant increase in passengers on Clapham Junction and New Cross Gate branches. Additionally, there is large increase in use of ELL of around 40% in both directions north of the development. Note that the switching of routes on Clapham Junction branch is due to addition of Brimmington Park station.

Figure 149: Percentage change in underground passenger flows vs Max Growth – Strategic Full



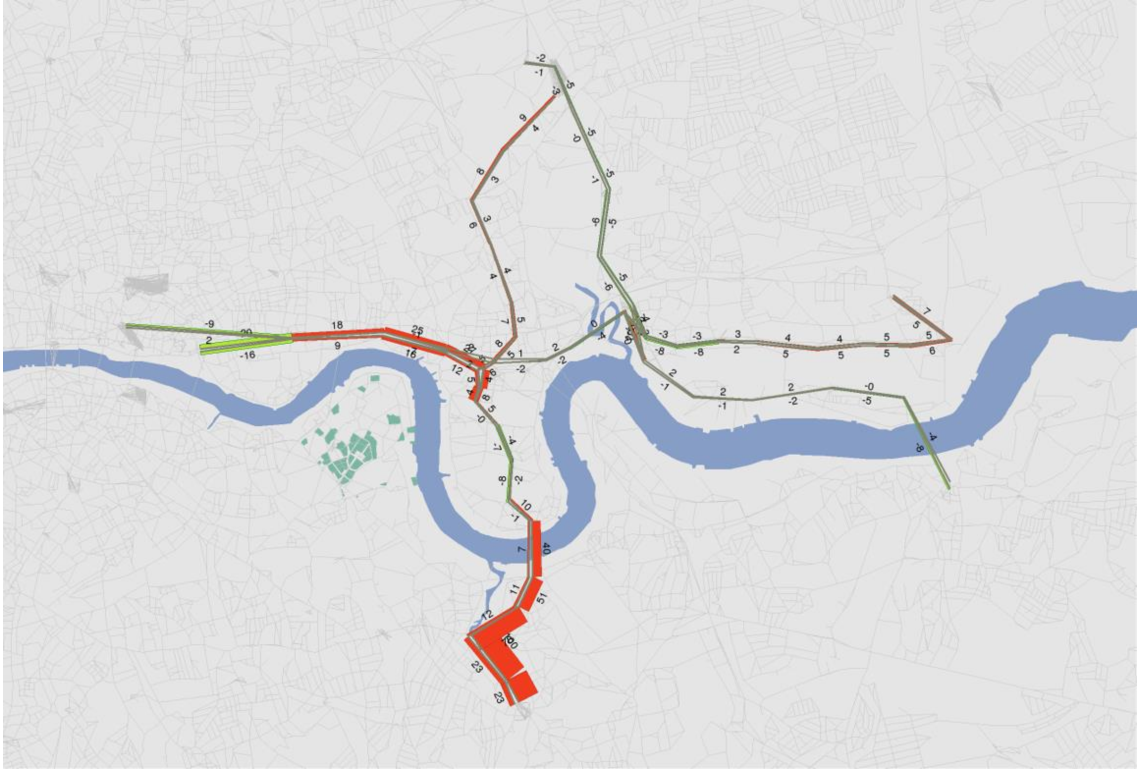
For underground we see an increase across the Bakerloo line resulting from its extension. On the other hand, large alleviation on north-south lines occurs due to Crossrail 2, and there is also a reduction in use of Jubilee Line of around 5% in both directions at Canada Water due to frequency increase of Elizabeth Line.

Figure 150: Percentage change in bus passenger flows vs Max Growth – Strategic Full



A decrease in bus passengers from Lewisham to Elephant & Castle occurs due to BLE, with an increase in patronage towards Lewisham to access BLE.

Figure 151: Percentage change in DLR passenger flows vs Max Growth – Strategic Full



For the DLR results are similar to the Strategic Lite packages, with notable increases in passengers in line with the Lewisham <> Bank/Stratford branch frequency increases and a large increase Southbound to access Bakerloo Line from Lewisham.

12.2.3.5 Headline impacts

- Bakerloo Line Extension – significant reduction of -50% on Overground NB > Jubilee WB movements at Canada Water
- Main bus package – global decrease in passenger KM of 6.6% due to Bakerloo Line Extension, Crossrail 2 and other schemes
- 36 tph Jubilee Line/32 tph Elizabeth Line – reduction of up to -5% on passenger flows via Canada Water
- 24 tph East London Line – approximately +30% to +40% passenger flows on ELL via Canada Water, largest increases on Clapham Junction and New Cross Gate branches
- 30 tph DLR – approximately +20% passenger flows NB from Lewisham to Canary Wharf
- Shadwell interchange improvement – approximately +20% passenger flows EB towards Canary Wharf
- Second (additional) station entrance at Surrey Quays – approximately +60% station exits from NB ELL

12.3 HAM Highway Mitigation Package Tests

Following assessment of the cycle superhighway options described in **Section 11.2**, the option 2 design was chosen as the best performing design with regards to flow, delay and journey time differences. The highway design was included in the LTS network for two further LTS runs, a 2031 ‘Strategic Lite’ run and a 2041 ‘Strategic Full’ run.

12.3.1 2031 Strategic Lite

The 2031 ‘Strategic Lite’ scenario, as described in **Section 12.1.1**, includes a range of public transport improvements, with no changes made to the highway network as CS4 is already included in all LTS forecasting runs. Checks and assessment of the 2031 ‘Strategic Lite’ highway demand revealed that the public transport improvements included in the LTS scenario had minimal differences with the 2031 medium growth highway demand, used in the ‘fixed demand’ intervention tests described in **Section 11**.

Following the assignment of the 2031 ‘Strategic Lite’ demand on to the CS4 option 2 network, it was apparent that the scenarios were almost identical, and no value would be added to the study through the analysis of this scenario. It was therefore decided that the highway assignment associated with this scenario should be ignored and the CS4 option 2 scenario, as described in **Section 11.2.2** should be used in its place.

12.3.2 2041 Strategic Full

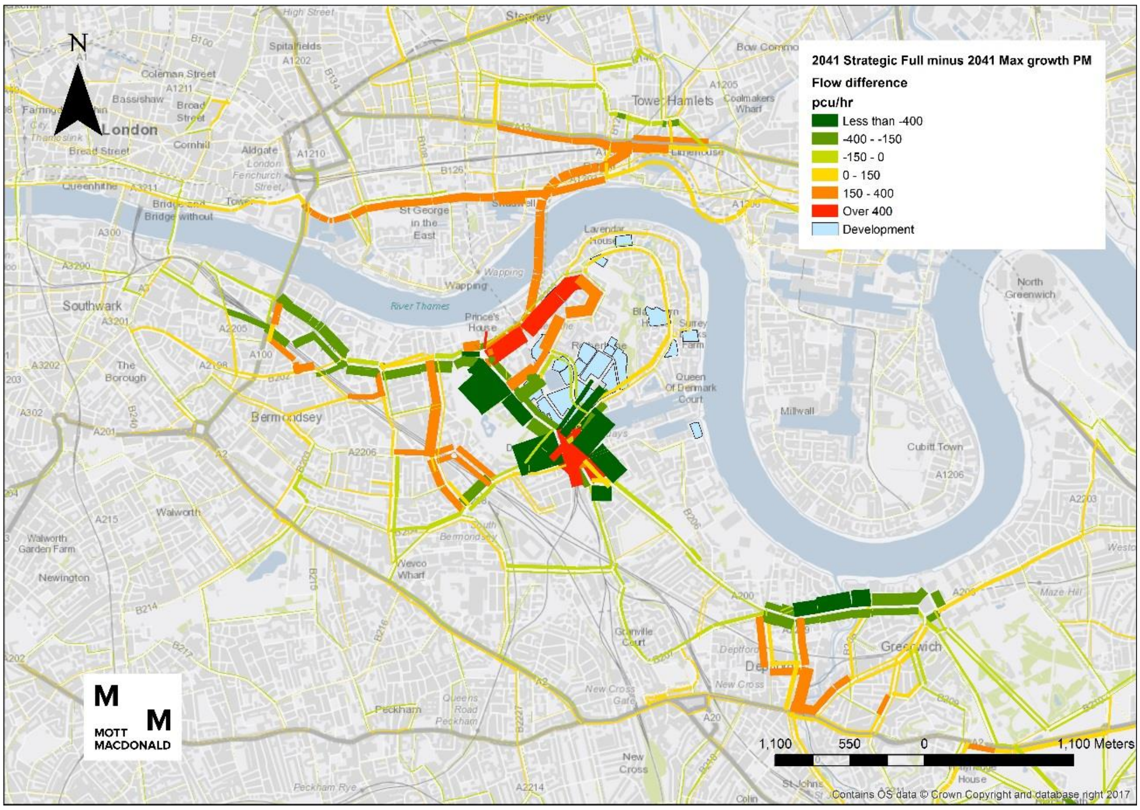
As described in **Section 12.1.2**, the 2041 ‘Strategic Full’ LTS scenario includes all potential major public transport schemes including Crossrail 2 and all potential major development. These major strategic interventions are likely to have a significant impact on highway demand in the Canada Water area and therefore will be analysed to examine any potential changes in flows, delays and journey times.

It was also assumed that TfL’s ‘Healthy Streets’ plan will also discourage the use of private vehicles in this scenario and thus the ‘low-car’ factors were applied, as described in **Section 11.1**.

12.3.3 2041 ‘Strategic Full’ compared with 2041 ‘Maximum’ growth

Figure 152 below shows the difference in total actual flow between the 2041 ‘Strategic Full’ scenario and the 2041 ‘Maximum’ growth scenario. This comparison isolates the impacts of the 2041 ‘Strategic Full’ interventions including additional public transport services such as Crossrail 2 and also road space re-allocation such as CS4 Option 2. The same medium growth development scenarios are used for both 2041 scenarios in the Canada Water area.

Figure 152: 2041 'Strategic Full' scenario compared with 2041 'Maximum' growth scenario - flow difference

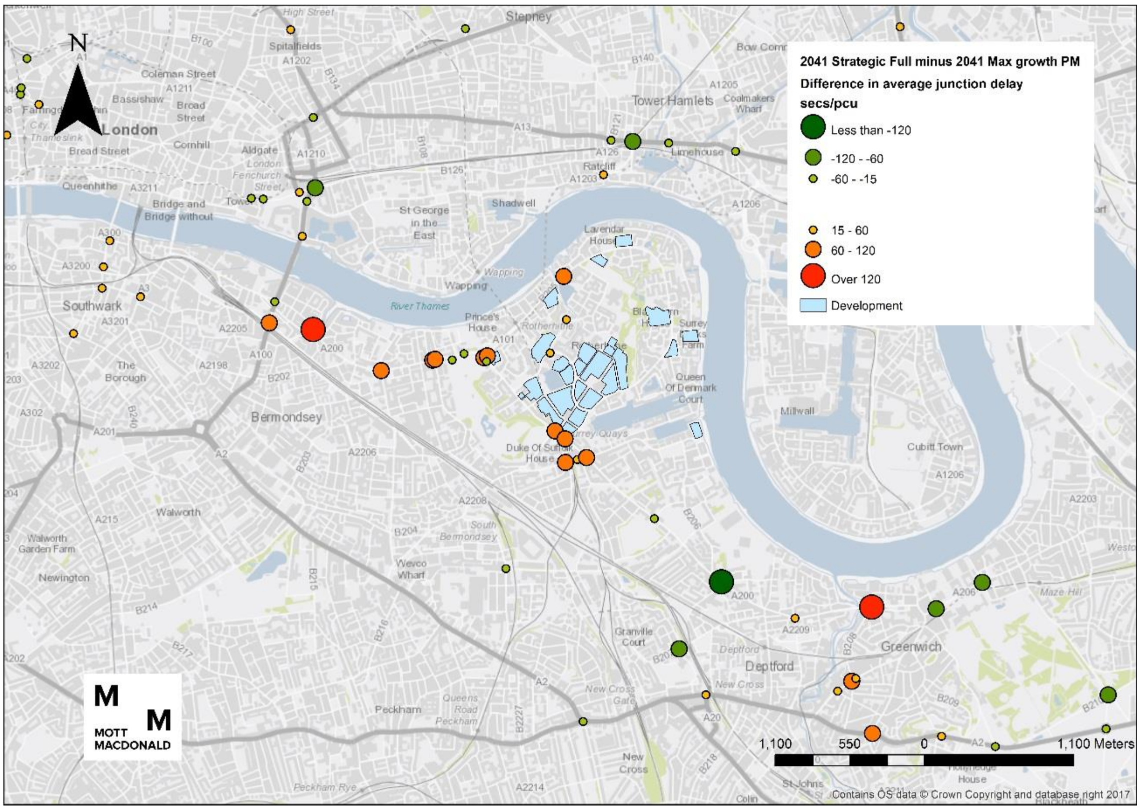


Source: Ordnance Survey data © Crown copyright and database right 2016

Flow differences shown in the figure above reveal similar patterns to those seen when comparing the 2031 CS4 option 2 scenario with the 2031 medium growth. This indicates that the differences shown are largely as a result of the introduction of CS4 option 2. The larger, strategic mode shifts as a result of Crossrail 2 will be effective outside of Canada Water.

Figure 153 below shows the difference in average junction delay between the 2041 ‘Strategic Full’ scenario and the 2041 ‘Maximum’ growth scenario.

Figure 153: 2041 ‘Strategic Full’ scenario compared with 2041 ‘Maximum’ growth scenario - delay difference

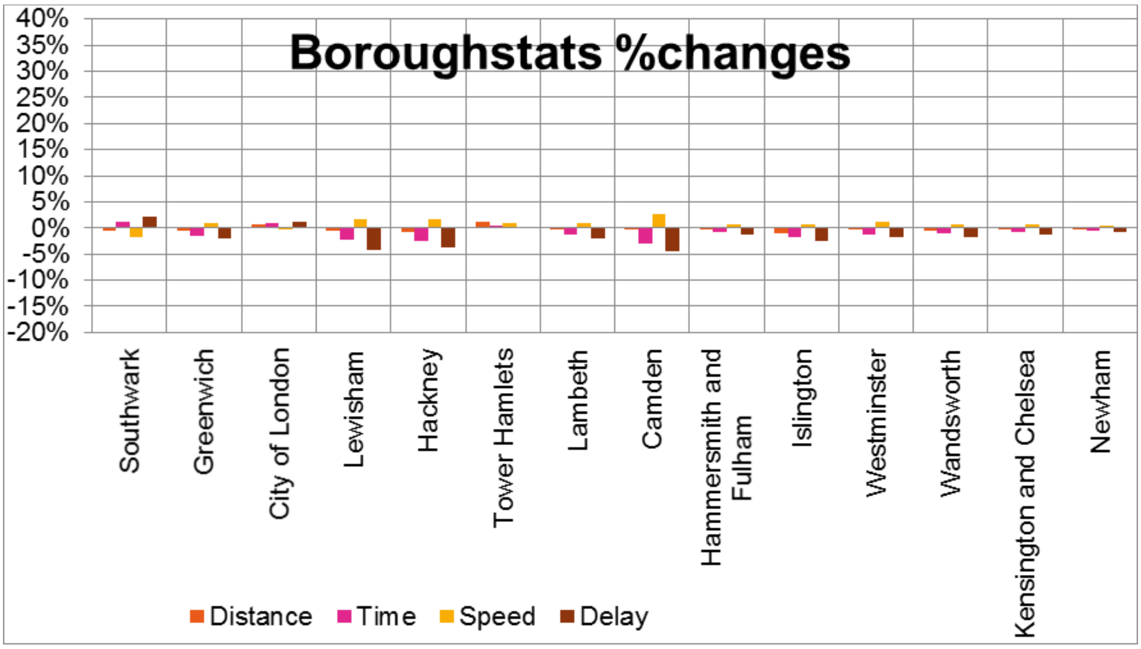


Source: Ordnance Survey data © Crown copyright and database right 2016

Similarly to the flow differences described above, the delay differences are largely as a result of the introduction of CS4 option 2. Delay increases at the Rotherhithe Tunnel roundabout and the Lower Rd gyratory are the same as the increases shown when comparing the 2031 CS4 option 2 scenario with the 2031 medium growth scenario. There are decreases in delay wider than the plot shown above in Camden and Hackney in particular as a result of a mode shift to public transport due to Crossrail 2.

Figure 154 below gives a summary, for selected boroughs, of the percentage changes in overall delay, average speed, overall travel time and overall travel distance for the 2041 ‘Strategic Full’ scenario compared with the 2041 ‘Maximum’ growth scenario. Full statistics can be seen in **Appendix B.11**

Figure 154: 2041 ‘Strategic Full’ scenario compared with 2041 ‘Maximum’ growth – borough statistics



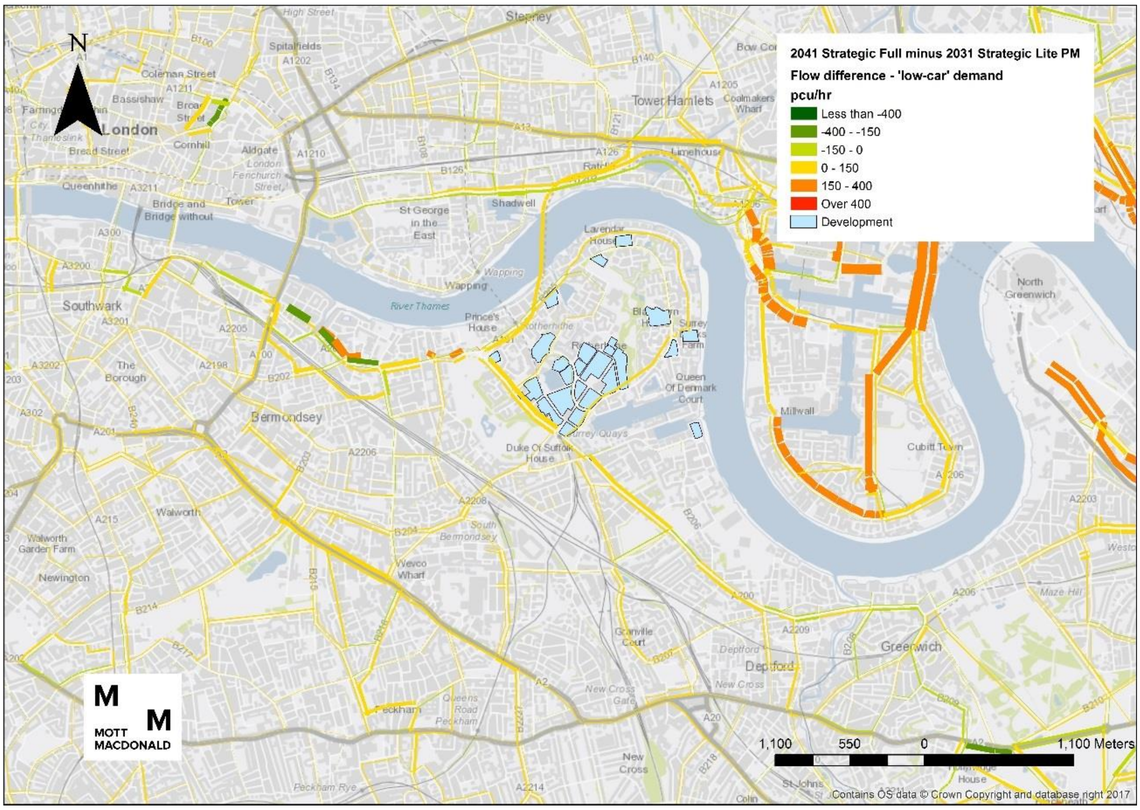
Source: HAM_BoroStats_3.8 - 2041SF minus 2041Max.xlsm

Wider public transport improvements result in a mode shift away from highway modes and result in decreases in delay in Camden and Hackney. The increases in delay in Southwark are as a result of the introduction of CS4 option 2.

12.3.4 2041 ‘Strategic Full’ compared with 2031 CS4 Option 2 scenario

Figure 155 below shows the difference in total actual flow between the 2041 ‘Strategic Full’ scenario and the 2031 CS4 option 2 scenario described above in **Section 11.2.2**. This comparison isolates the impacts of the 2041 ‘Strategic Full’ interventions as the demand arriving at and leaving the Canada Water area is the same between the scenarios.

Figure 155: 2041 'Strategic Full' scenario compared with 2031 CS4 Option 2 scenario - flow difference

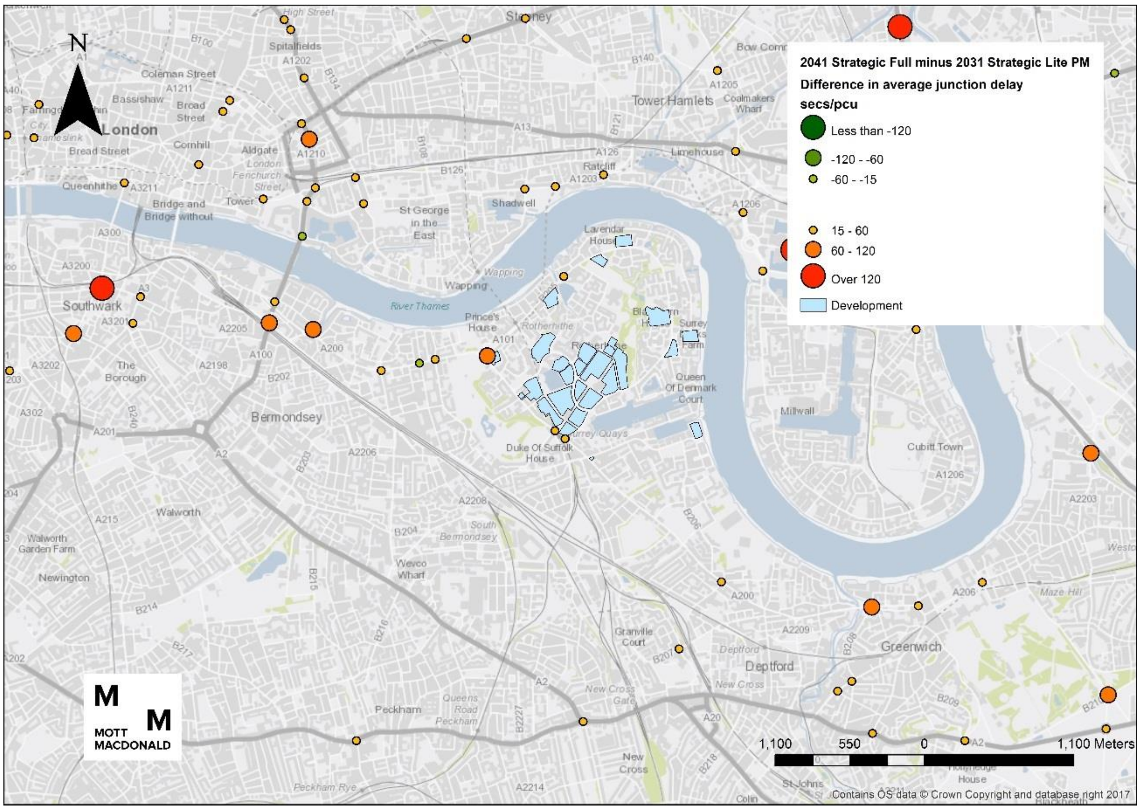


Source: Ordnance Survey data © Crown copyright and database right 2016

The figure above displays growth along Lower Road, Rotherhithe Tunnel and on the peninsula. Also displayed above is the significant increase in demand in the Isle of Dogs area due to the introduction of a large-scale development as part of the 2041 'Max growth' development inputs. Highway demand growth is experienced across south London due to the 'maximum' growth assumptions being used in the LTS scenario.

Figure 156 below shows the difference in average junction delay between the 2041 'Strategic Full' scenario and the 2031 CS4 option 2 scenario.

Figure 156: 2041 'Strategic Full' scenario compared with 2031 CS4 Option 2 scenario - delay difference

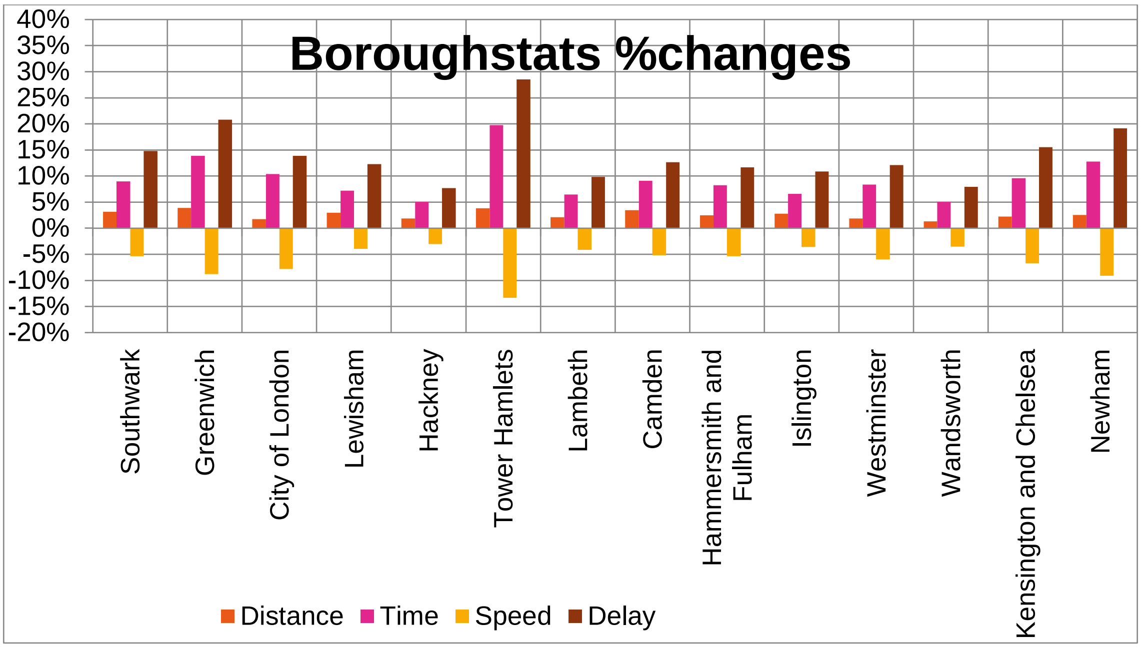


Source: Ordnance Survey data © Crown copyright and database right 2016

The figure above displays increases in delay at the Rotherhithe Tunnel roundabout and minor increases at the northern end of the Lower Road gyratory. Elsewhere displays increases in delay due to the 2041 'maximum' growth assumptions being used.

Figure 157 below gives a summary, for selected boroughs, of the percentage changes in overall delay, average speed, overall travel time and overall travel distance for the 2041 'Strategic Full' scenario compared with the CS4 option 2 scenario. Full statistics can be seen in **Appendix B.12**.

Figure 157: 2041 'Strategic Full' scenario compared with 2031 CS4 Option 2 scenario – borough statistics

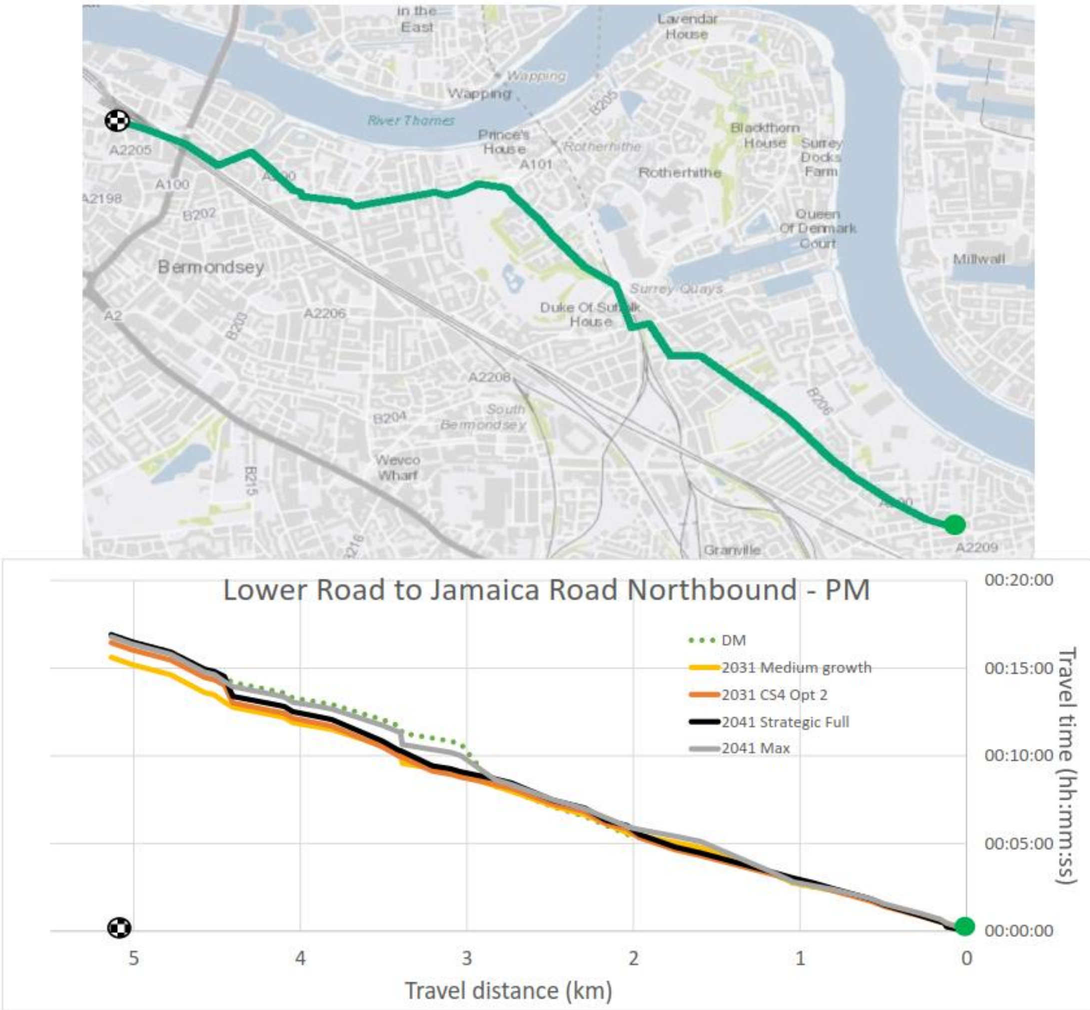


Source: HAM_BoroStats_3.8 - 2041SF minus 2031SL.xlsm

The figure above displays increases in delay in all of the selected boroughs shown due to the significant increase in demand between the 2031 GLA growth with Canada Water medium growth and the 2041 GLA maximum growth with Canada Water medium growth. There are large increases in delay specifically due to the inclusion of the large-scale Isle of Dogs development. Southwark and Greenwich give 15% and 20% increases in delay respectively across the boroughs due to the 'maximum' growth assumptions.

Figure 158 and **Figure 159** below show the change in travel times along the A200 corridor for the do-minimum, 2031 medium growth scenario, 2031 CS4 Option 2 scenario, 2041 'Strategic Full' scenario and the 2041 'Maximum' growth scenario.

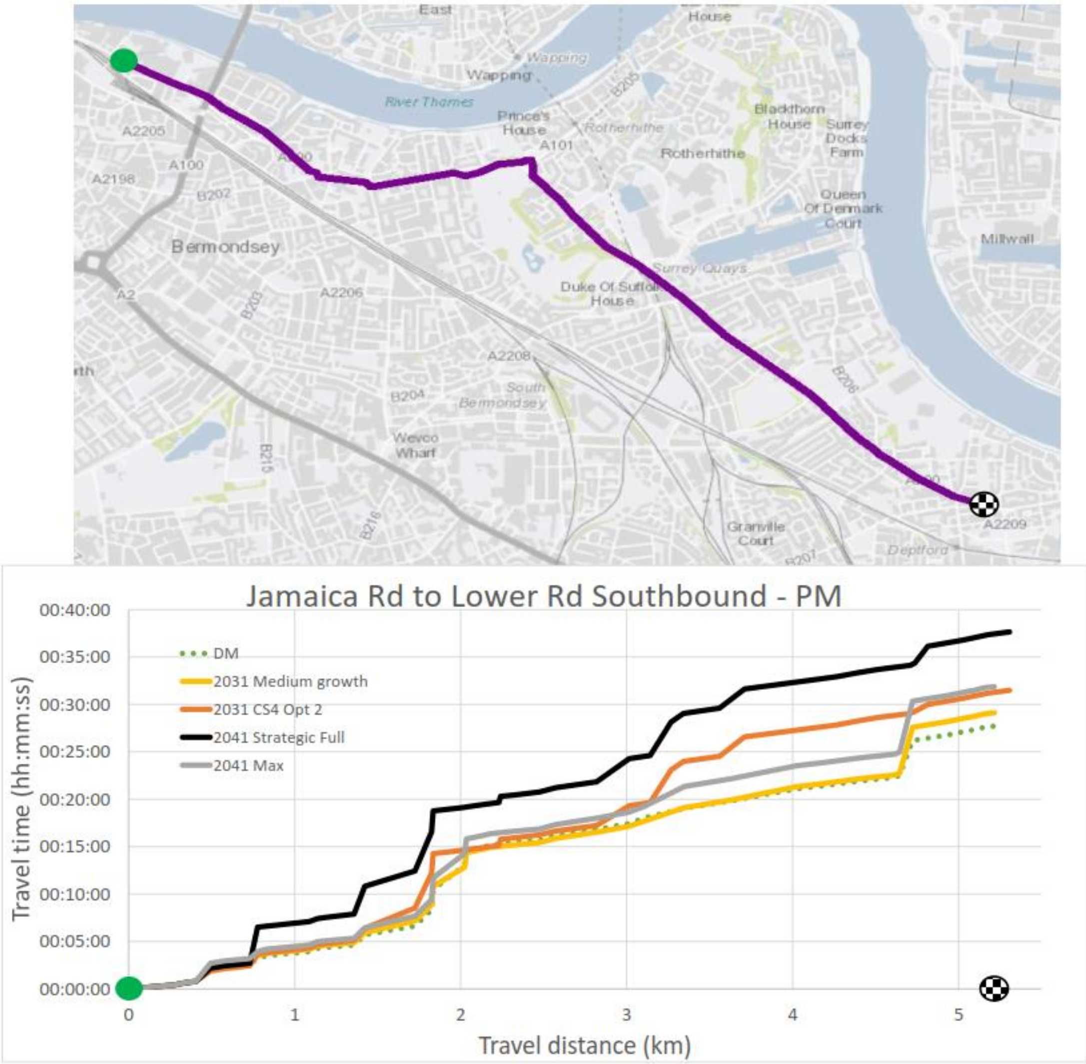
Figure 158: Journey times from Lower Road to Jamaica Road Northbound



Source: CW Journey Times_PM_v5_InterventionsPt2_lowcar_v4Optimised_2041.xlsx

2041 'Strategic Full' and the 2041 'Maximum Growth' scenarios have a minimal effect on northbound journey times and is similar to the 2031 do-minimum along the entire corridor.

Figure 159: Journey times from Lower Road to Jamaica Road Southbound



Source: CW Journey Times_PM_v5_InterventionsPt2_lowcar_v4Optimised_2041.xlsx

The 2041 background high growth with CS4 option 2 increases the total southbound journey time by approximately 20% over the entire route when compared to the 2031 CS4 option 2 scenario. The 2041 background high growth alone gives similar southbound journey times to the 2031 medium growth scenario with CS4 option 2

13 Intervention testing conclusions

13.1 Public Transport Intervention Testing Conclusions

The public transport challenges identified in Section 7 are the cumulative impact of background growth and the localised impact of the OA development. As such, the mitigation schemes tested are of a generally strategic nature, aimed at relieving background traffic and crowding conditions through Canada Water and assessment is focussed on their potential to relieve any additional impacts arising from the OA development.

Major transport schemes such as enhancements to Crossrail and Jubilee Line frequency have shown to achieve these aims, though to a relatively small degree as additional capacity tends to be backfilled by switching from other services. This is also the case with East London Line enhancements, where to a large degree additional capacity is backfilled by latent demand, though crowding conditions through Canada Water do ultimately ease.

More localised schemes show smaller strategic impacts; for example the enhanced bus strategy significantly increases bus use but is unable to make a significant positive impact on what are heavily used strategic rail routes. The improvements to Shadwell station exhibited some of the largest benefits in relieving interchange at Canada Water, however, the nature of this test and the relative disconnect between representing an urban realm focussed scheme in a quantitative model means that in isolation the impact of this test should be treated with caution.

The Bakerloo Line Extension has proven to be one of the most effective schemes to benefit Canada Water; the relief to East London Line to Jubilee Line westbound interchange through providing an alternative at New Cross Gate notably lowers this movement through Canada Water. It is the Bakerloo Line that dominates the combined positive impact in the Strategic Lite with BLE test.

The conclusions of the 2041 Max Growth test are that this substantially alleviates the impacts of the Maximum OA build out across London, however, supply and demand are still such that existing challenges around Canada Water remain and other areas of London see changes due to major schemes such as Crossrail 2.

13.2 Highway Intervention Testing Conclusions

A number of conclusions can be drawn from the results given in **Section 11**.

If the Mayor's Transport Strategy target of 80% of all trips to be made by public transport, walking or cycling for new developments is met, and there is a reduction in car traffic to and from the Canada Water development area, then **Section 11.1** shows how this will impact the local network. Whilst there are reductions in traffic flow on the peninsula, i.e. Surrey Quays Road and Salter Road, the reduced local highway traffic is replaced by longer distance, 'through' traffic, aiming to access the Rotherhithe Tunnel. This results in a zero net change in Rotherhithe Tunnel traffic with only minimal changes in delay if the reduction in private car traffic is achieved.

Tests undertaken in **Section 11.2** show the impacts that a Rotherhithe Tunnel charge is likely to have on the Canada Water development area. It appears that the introduction of the tolled Silvertown Tunnel, along with a toll on the Blackwall Tunnel has a minimal impact on traffic flows on and around the peninsula. However, when a £3 toll is applied to the Rotherhithe Tunnel in the southbound direction alongside the introduction of the tolled Silvertown Tunnel and applying a toll to the Blackwall Tunnel results in larger reductions on Lower Road, in particular, and also southbound in the Rotherhithe Tunnel.

Section 11.2 displays expected impacts from four design options which include road space re-allocation to allow room for cycle superhighway 4. Alongside this, London Borough Southwark have a policy to re-design the existing gyratory on Lower Road. Options 1 to 4 therefore include various combinations of road space reallocation along the A200 corridor along with the restructuring of the gyratory. It appears that all options redistribute traffic from the A200 on to minor roads such as Southwark Park Road, Needleman Street and Salter Road. Through further assessment of each option using flow and delay differences, it was decided that option 2 was the best performing design and also addressed both TfL and LBS policies of introducing cycle superhighway 4 and a Lower Road gyratory re-structure respectively. Because of this, option 2 was taken forward to be tested in the LTS demand model in order to capture any demand response that the re-designs are likely to incur.

The option 2 design was included in a package of interventions to be tested in the LTS demand model in both 2031 (‘Strategic Lite’) and 2041 (‘Strategic Full’) along with various public transport improvements. As explained in **Section 12.3.1**, the 2031 Strategic Lite scenario gave almost identical results to the option 2 scenario displayed in **Section 11.2.2**, with the 2041 Strategic Full scenario giving similar results when compared with the 2041 ‘Maximum growth’ scenario.

Overall, it appears that option 1 seems to retain more traffic on the strategic network (A200) with smaller displacement on to minor roads when compared to option 2. However, option 2 gives reduced delay in the area with better journey times along key corridors and on bus routes. Option 2 also delivers two key policies for both TfL and LBS with CS4 and the Lower Road gyratory re-structure.

14 Overall Strategic Modelling Conclusions

The conclusions of this Forecasting Report and subsequent key themes in the STS are focussed around the implications of developing an area whose existing highway and public transport routes are highly stressed in current day conditions and that will, even without additional development, will come under further stress due to background growth predicted in the capital.

Some of the challenges identified could also be adversely affected by land developments elsewhere, by changes in committed network improvements (for example, the uncertainty surrounding Northern and Jubilee Line upgrades) and parallel policies such as road space reallocation.

The modelling has shown that the Medium growth scenario generates significantly more trips than the Do-Minimum committed scenario. Adjustments have been made to the modelling to reflect low car mode share which will need to be achieved to mitigate this, the results suggest that further measures to manage demand and promote non-motorised modes is necessary to retain efficient highway and public transport networks and functional, safe stations for access and interchange; these principles and targets form a major theme in the Mayors Transport Strategy and provide the background context to this assessment.

Furthermore, the level of development that can be accommodated depends on major investment decisions for stakeholders and the level of service enhancements on key services, in particular investment in Jubilee Line and London Overground services (relevant to a 2030s time horizon). In the context of long-term wider London development, and in particular development on the Greenwich Peninsular, Isle of Dogs, Lewisham and Old Kent Road, the introduction of major infrastructure projects including BLE, DLR enhancements and Crossrail2 are also key (relevant to a 2040s time horizon).

The study also highlights a range of more local schemes such as improving bus provision to reduce crowding on the rail network. Cycle Superhighway 4 offers better and safer cycling facilities to encourage the shift from motorised modes, however, cycle and pedestrian access to Canary wharf and locations across the Thames could help to significantly alleviate the capacity issues on the Jubilee Line. The modelling showed that access to the development for highway traffic would need to be carefully considered, arrangements to accommodate the additional trips on strategic roads were necessary to prevent rat-running through the Peninsular and to the west of Lower Road – a particular challenge if road-space is reallocated. Beyond the locality re-routeing of strategic traffic needs to be considered.

Appendices

A. Highway trips sectored by borough

Table 47: 2031 Do-minimum sectored trips

2031 Do-Minimum		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Total
Rest of the world	1	4,935,126	60	793	668	1,161	2,961	1,370	950	771	774	724	979	504	497	1,314	96	34,915	20,131	15,888	25,034	5,044,715
Development area	2	122	187	47	482	207	145	5	5	2	12	6	175	6	14	27	27	6	19	99	27	1,620
Lambeth	3	723	74	6,238	2,601	645	135	1,891	135	262	661	188	124	128	15	39	238	219	35	91	2,939	17,380
Southwark	4	651	555	2,369	9,662	2,003	394	556	120	85	348	175	273	110	90	138	791	122	83	173	1,219	19,915
Lewisham	5	1,518	193	380	1,519	5,865	2,546	116	7	14	21	16	152	9	18	90	18	36	91	876	3,386	16,872
Greenwich	6	3,027	61	94	365	1,779	12,743	36	6	12	36	10	331	15	51	535	9	43	415	5,512	1,317	26,397
Wandsworth	7	2,276	8	2,218	499	119	32	6,555	667	629	331	78	44	43	7	27	27	1,351	45	40	4,798	19,793
Hammersmith and Fulham	8	1,342	1	149	61	9	2	1,210	4,352	1,470	590	199	14	51	7	9	12	3,191	97	10	569	13,346
Kensington and Chelsea	9	540	1	192	127	12	8	691	1,233	3,835	2,910	395	21	49	7	20	62	1,369	53	13	157	11,695
City of Westminster	10	890	4	803	440	9	36	399	942	3,322	19,047	3,789	134	926	49	93	806	1,749	424	33	69	33,965
Camden	11	935	4	429	143	5	20	94	150	476	3,448	6,529	157	2,224	739	47	432	925	2,352	40	40	19,189
Tower Hamlets	12	2,436	128	189	489	277	578	128	74	37	338	299	8,842	693	1,440	2,304	483	150	2,218	1,339	185	22,627
Islington	13	537	5	122	211	8	30	42	37	41	484	1,871	511	3,351	1,490	107	778	146	1,975	44	19	11,812
Hackney	14	855	6	41	109	38	100	22	15	21	96	350	1,524	1,409	4,323	370	304	67	2,987	261	49	12,944
Newham	15	2,228	11	39	80	82	259	28	17	9	107	69	2,377	104	381	9,508	75	80	4,300	2,018	73	21,843
City of London	16	192	48	557	374	17	3	92	33	86	841	834	791	517	307	140	1,617	13	114	115	20	6,710
West	17	37,825	7	212	115	19	83	1,524	3,087	1,481	1,793	1,127	79	291	65	132	34	114,985	7,405	251	3,456	173,971
North	18	20,917	6	56	74	113	293	46	100	106	526	2,213	1,286	1,998	2,095	3,355	99	8,413	95,394	5,813	137	143,040
East	19	15,248	18	61	216	495	5,241	32	9	11	43	42	596	61	115	1,949	28	202	5,891	41,870	1,633	73,761
South	20	21,290	17	2,679	944	3,111	1,489	3,685	365	124	53	35	87	30	16	112	18	2,589	164	1,724	86,451	124,985
Total		5,048,680	1,396	17,668	19,178	15,975	27,097	18,522	12,305	12,793	32,457	18,950	18,497	12,518	11,724	20,314	5,953	170,573	144,195	76,210	131,577	5,816,582

Source: CW_HAM_Sectored comparison_PM_v3.xlsx

Table 48: 2031 Medium growth sectored trips

2031 Medium growth		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Total
Rest of the world	1	4,935,020	96	787	659	1,150	2,932	1,363	946	767	771	720	972	501	492	1,304	96	34,782	20,032	15,815	24,930	5,044,134
Development area	2	230	319	59	594	280	228	25	10	10	19	23	218	15	21	41	41	11	38	123	66	2,371
Lambeth	3	721	84	6,233	2,594	642	134	1,883	134	261	661	188	123	128	15	39	238	220	35	90	2,938	17,361
Southwark	4	648	656	2,360	9,604	1,987	386	551	120	84	345	174	268	109	90	136	787	121	83	172	1,215	19,896
Lewisham	5	1,515	233	378	1,502	5,831	2,531	114	7	14	21	16	149	9	17	88	18	36	91	874	3,378	16,821
Greenwich	6	3,027	93	94	361	1,770	12,726	35	6	11	36	9	330	15	51	534	8	42	415	5,511	1,314	26,390
Wandsworth	7	2,274	27	2,211	494	117	32	6,544	666	628	330	78	42	43	7	27	26	1,350	45	40	4,795	19,775
Hammersmith and Fulham	8	1,341	5	149	60	9	2	1,207	4,348	1,467	589	199	14	51	7	9	12	3,188	97	10	568	13,331
Kensington and Chelsea	9	539	8	192	127	12	8	688	1,230	3,830	2,907	390	20	49	7	20	61	1,369	53	13	157	11,679
City of Westminster	10	891	14	801	437	9	36	397	939	3,315	19,051	3,784	133	924	48	93	805	1,752	424	33	69	33,958
Camden	11	936	24	429	142	5	20	94	149	471	3,445	6,522	154	2,221	735	46	431	925	2,349	40	40	19,177
Tower Hamlets	12	2,435	178	187	481	264	572	126	72	35	335	296	8,799	689	1,431	2,294	474	149	2,209	1,335	182	22,544
Islington	13	536	12	121	210	8	29	42	37	41	484	1,868	508	3,344	1,485	107	778	147	1,972	45	19	11,792
Hackney	14	852	11	41	107	36	99	22	15	21	95	347	1,516	1,403	4,318	368	303	67	2,985	261	48	12,915
Newham	15	2,223	29	39	77	79	257	28	17	9	106	69	2,368	103	379	9,474	74	80	4,295	2,015	72	21,794
City of London	16	193	68	557	369	15	2	91	32	86	840	834	779	516	303	139	1,618	13	115	115	20	6,705
West	17	37,853	10	212	115	19	82	1,523	3,086	1,481	1,794	1,127	79	290	64	132	34	115,020	7,408	251	3,457	174,036
North	18	20,925	13	56	72	111	292	46	100	106	526	2,210	1,279	1,994	2,092	3,354	99	8,418	95,390	5,817	137	143,034
East	19	15,252	25	61	215	493	5,237	32	9	11	43	42	595	61	115	1,948	28	202	5,894	41,878	1,635	73,776
South	20	21,303	32	2,678	941	3,107	1,483	3,682	364	124	54	35	86	30	16	112	18	2,591	164	1,726	86,472	125,017
Total		5,048,713	1,937	17,642	19,162	15,945	27,086	18,492	12,289	12,773	32,451	18,930	18,431	12,496	11,694	20,264	5,950	170,483	144,094	76,163	131,512	5,816,506

Source: CW_HAM_Sectored comparison_PM_v3.xlsx

Table 49: 2031 Medium growth sectored trips – difference from 2031 Do-Minimum

2031 Medium growth		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Total
Rest of the world	1	-107	36	-6	-8	-11	-29	-7	-5	-5	-4	-4	-7	-3	-5	-10	-0	-133	-99	-73	-104	-582
Development area	2	108	132	12	112	73	82	20	5	8	8	17	43	9	7	14	14	4	19	24	39	751
Lambeth	3	-1	10	-5	-7	-3	-1	-8	-0	-1	0	-0	-1	-0	-0	-0	-0	1	0	-0	-1	-19
Southwark	4	-3	100	-8	-58	-17	-8	-5	-0	-0	-2	-2	-5	-1	-0	-1	-4	-0	0	-1	-4	-20
Lewisham	5	-4	41	-2	-17	-34	-15	-2	-0	-0	-0	-0	-3	-0	-0	-1	-1	-0	-1	-2	-8	-51
Greenwich	6	-0	32	-1	-5	-9	-17	-0	-0	-0	-0	-0	-1	-0	-0	-0	-0	-1	-0	-1	-3	-7
Wandsworth	7	-1	19	-8	-4	-2	-0	-11	-1	-1	-0	-0	-2	-0	-0	-0	-0	-1	-0	-0	-3	-18
Hammersmith and Fulham	8	-1	5	-1	-1	-0	-0	-4	-4	-2	-1	-0	-0	-0	-0	-0	-0	-2	-0	-0	-1	-15
Kensington and Chelsea	9	-1	7	-1	0	-0	-0	-3	-3	-5	-3	-5	-1	-0	-0	-0	-0	-1	-0	-0	-0	-16
City of Westminster	10	1	10	-1	-3	-0	-0	-2	-3	-7	4	-5	-2	-1	-1	-0	-0	3	0	0	0	-7
Camden	11	0	19	-1	-1	-0	-0	-1	-1	-4	-3	-7	-3	-3	-4	-1	-1	-0	-3	0	-0	-11
Tower Hamlets	12	-2	49	-1	-8	-12	-6	-2	-2	-1	-3	-3	-43	-4	-9	-10	-9	-1	-9	-4	-3	-84
Islington	13	-1	6	-1	-1	-0	-0	-0	-0	-0	-0	-3	-3	-7	-5	-0	0	0	-3	0	0	-20
Hackney	14	-3	5	-0	-1	-1	-1	-0	-0	-0	-0	-3	-8	-5	-5	-2	-2	0	-3	-0	-0	-29
Newham	15	-5	18	-1	-2	-3	-1	-0	-0	-0	-0	-0	-10	-0	-2	-34	-1	-0	-5	-3	-1	-50
City of London	16	0	20	-0	-5	-1	-0	-1	-0	-0	-1	-1	-11	-1	-4	-1	0	0	0	-0	0	-5
West	17	28	3	-0	-1	-0	-1	-1	-1	-0	0	-1	-0	-0	-0	-0	0	35	3	0	2	65
North	18	8	6	-0	-1	-2	-1	-0	-0	-0	-0	-3	-7	-4	-2	-1	-0	5	-4	3	-0	-6
East	19	4	8	-0	-2	-2	-4	-0	-0	-0	-0	-0	-1	-0	-0	-1	-0	0	3	8	2	15
South	20	12	14	-1	-3	-4	-6	-3	-0	0	0	-0	-1	-0	-0	-0	0	2	0	1	21	33
Total		33	541	-26	-16	-30	-10	-30	-17	-20	-6	-20	-66	-22	-30	-50	-3	-90	-101	-48	-65	-76

Source: CW_HAM_Sectored comparison_PM_v3.xlsx

Table 50: 2041 Maximum growth sectored trips

2041 Maximum growth		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Total
Rest of the world	1	5,076,972	104	868	758	1,195	3,312	1,481	1,129	776	808	767	1,100	542	547	1,396	98	37,588	21,672	17,213	27,141	5,195,467
Development area	2	223	293	62	617	265	229	24	16	8	19	21	211	14	21	41	38	11	35	122	63	2,334
Lambeth	3	749	88	6,159	2,613	649	147	1,906	146	258	666	195	135	131	18	45	247	231	41	102	2,962	17,490
Southwark	4	684	662	2,372	9,778	2,003	416	562	125	81	348	185	299	115	97	148	803	125	90	189	1,234	20,318
Lewisham	5	1,511	220	378	1,529	5,511	2,516	122	13	14	21	17	156	9	18	99	18	38	92	895	3,336	16,512
Greenwich	6	3,258	96	102	388	1,745	13,331	39	9	12	39	12	347	16	52	545	9	67	433	5,944	1,418	27,863
Wandsworth	7	2,324	26	2,234	513	130	38	6,428	684	629	342	84	53	46	8	31	29	1,375	55	48	4,808	19,886
Hammersmith and Fulham	8	1,610	11	174	69	18	8	1,255	4,877	1,558	649	239	22	73	14	21	24	3,894	230	29	634	15,407
Kensington and Chelsea	9	542	7	201	131	12	11	697	1,327	3,664	2,872	371	23	52	8	21	63	1,337	54	17	172	11,583
City of Westminster	10	900	13	822	455	10	39	422	1,021	3,258	19,114	3,822	151	929	51	99	814	1,728	470	39	89	34,247
Camden	11	969	22	441	156	8	30	103	188	449	3,470	6,525	173	2,228	751	52	444	900	2,428	47	51	19,437
Tower Hamlets	12	2,482	177	198	522	269	577	131	82	31	354	311	9,421	695	1,434	2,469	485	177	2,286	1,382	185	23,667
Islington	13	557	11	127	222	11	33	46	58	40	489	1,881	517	3,268	1,480	116	801	154	2,024	48	23	11,905
Hackney	14	861	10	45	116	37	102	23	22	21	96	359	1,503	1,381	4,256	382	308	68	3,019	263	51	12,921
Newham	15	2,427	31	46	96	97	303	35	27	12	113	74	2,532	109	393	9,628	73	89	4,443	2,270	94	22,891
City of London	16	206	64	565	384	19	4	92	48	81	841	843	793	532	302	144	1,614	16	123	120	25	6,816
West	17	39,551	10	227	121	22	107	1,543	3,453	1,439	1,803	1,129	93	301	69	139	36	115,402	7,727	287	3,564	177,021
North	18	21,752	13	64	87	112	318	53	181	102	541	2,236	1,350	1,990	2,094	3,381	104	8,674	95,497	5,958	153	144,659
East	19	15,875	25	65	227	488	5,553	35	19	12	45	46	652	65	115	2,026	28	227	5,977	42,625	1,687	75,793
South	20	22,247	30	2,684	955	3,071	1,567	3,692	380	123	60	39	102	32	17	123	20	2,655	180	1,808	87,161	126,945
Total		5,195,699	1,912	17,835	19,737	15,671	28,640	18,690	13,804	12,570	32,688	19,155	19,634	12,526	11,745	20,906	6,056	174,757	146,875	79,406	134,853	5,983,160

Source: CW_HAM_Sectored comparison_PM_v3.xlsx

Table 51: 2041 Maximum growth sectored trips – difference from 2031 Medium growth

2041 Maximum growth		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Total
Rest of the world	1	141,953	8	82	99	44	380	118	184	10	38	47	128	41	55	92	2	2,806	1,640	1,398	2,210	151,333
Development area	2	-7	-27	4	24	-15	1	-1	5	-2	-1	-2	-7	-1	0	-0	-3	0	-3	-0	-3	-37
Lambeth	3	27	4	-74	19	7	13	23	12	-3	5	7	12	3	4	7	10	11	6	12	23	128
Southwark	4	36	7	12	174	16	30	11	5	-3	3	11	31	6	8	12	16	4	7	17	20	422
Lewisham	5	-4	-13	1	27	-320	-15	8	5	0	0	1	7	1	0	10	0	2	2	21	-43	-309
Greenwich	6	231	3	8	27	-25	605	4	3	1	3	3	17	1	1	11	1	25	18	433	104	1,473
Wandsworth	7	50	-1	23	19	12	7	-116	18	1	12	6	11	3	2	4	3	24	10	8	14	111
Hammersmith and Fulham	8	269	6	25	8	9	6	48	529	91	60	40	9	22	7	12	12	706	133	19	66	2,076
Kensington and Chelsea	9	3	-1	9	4	1	3	10	97	-166	-35	-19	3	4	1	2	1	-32	1	4	16	-96
City of Westminster	10	9	-1	20	19	1	4	24	82	-56	63	38	19	4	3	6	9	-25	45	6	20	289
Camden	11	34	-2	12	14	3	10	9	39	-22	24	3	19	7	16	6	13	-25	79	7	11	259
Tower Hamlets	12	48	-1	11	40	4	5	6	10	-4	19	15	621	6	3	175	11	29	77	47	3	1,123
Islington	13	20	-0	6	12	3	3	4	21	-1	6	13	9	-76	-5	9	22	7	52	3	4	113
Hackney	14	9	-1	4	9	0	3	2	6	0	1	12	-13	-23	-63	14	5	2	34	3	2	6
Newham	15	204	2	8	19	18	46	7	10	2	6	5	164	5	13	154	-1	9	148	255	22	1,098
City of London	16	13	-4	9	15	4	2	1	15	-5	0	9	14	16	-2	6	-4	3	8	6	5	111
West	17	1,698	0	15	7	3	25	19	367	-42	9	3	14	10	4	7	2	382	319	35	107	2,986
North	18	826	0	8	14	1	26	7	81	-4	15	26	71	-4	2	27	5	256	107	141	17	1,624
East	19	623	-1	4	12	-5	316	3	9	1	2	4	58	4	1	78	-0	25	83	747	52	2,017
South	20	944	-2	6	14	-36	84	10	15	-1	6	3	16	2	1	11	2	65	15	82	689	1,928
Total		146,987	-25	194	575	-274	1,553	198	1,515	-203	237	225	1,203	30	51	642	106	4,275	2,781	3,244	3,340	166,654

Source: CW_HAM_Sectored comparison_PM_v3.xlsx

B. Highway borough statistics

B.1 2031 Do-Minimum compared with 2012 Base year

Table 52: 2031 Do-Minimum compared with 2012 Base year – Borough statistics

	Travel Distance (pcu-km)				Travel Time (pcu-hours)				Average Speed (km/h)				Level of Delay (Delays pcu-hours)			
London Borough	2012 CW Base PM	2031 CW DM PM	Change	% Change	2012 CW Base PM	2031 CW DM PM	Change	% Change	2012 CW Base PM	2031 CW DM PM	Change	% Change	2012 CW Base PM	2031 CW DM PM	Change	% Change
Southwark	102,133	102,136	3	0%	6,118	6,744	626	10%	16.7	15.1	-1.5	-9%	2,766	3,238	472	17%
Greenwich	198,574	211,080	12,505	6%	9,344	11,274	1,930	21%	21.3	18.7	-2.5	-12%	4,643	6,263	1,620	35%
City of London	20,256	19,780	-476	-2%	1,460	2,444	984	67%	13.9	8.1	-5.8	-42%	772	1,722	951	123%
Lewisham	92,100	95,887	3,787	4%	5,144	5,740	595	12%	17.9	16.7	-1.2	-7%	2,111	2,574	463	22%
Hackney	77,167	78,947	1,780	2%	4,342	5,147	805	19%	17.8	15.3	-2.4	-14%	2,091	2,777	687	33%
Tower Hamlets	127,449	134,766	7,317	6%	6,842	9,675	2,833	41%	18.6	13.9	-4.7	-25%	3,575	6,154	2,579	72%
Lambeth	104,344	102,234	-2,110	-2%	6,006	6,756	750	12%	17.4	15.1	-2.2	-13%	2,998	3,710	712	24%
Camden	83,863	77,714	-6,149	-7%	5,942	7,108	1,167	20%	14.1	10.9	-3.2	-23%	3,037	4,250	1,212	40%
Hammersmith and Fulham	62,934	62,687	-247	0%	4,196	4,621	425	10%	15.0	13.6	-1.4	-10%	2,367	2,797	430	18%
Islington	52,819	53,468	650	1%	3,140	3,566	426	14%	16.8	15.0	-1.8	-11%	1,325	1,656	331	25%
Westminster	141,944	134,764	-7,180	-5%	9,589	11,370	1,781	19%	14.8	11.9	-3.0	-20%	5,168	7,152	1,984	38%
Wandsworth	113,946	116,853	2,906	3%	6,477	7,245	768	12%	17.6	16.1	-1.5	-8%	3,303	3,997	694	21%
Kensington and Chelsea	76,500	75,016	-1,484	-2%	4,724	5,044	320	7%	16.2	14.9	-1.3	-8%	2,425	2,785	359	15%
Newham	148,781	165,448	16,667	11%	6,873	8,909	2,035	30%	21.6	18.6	-3.1	-14%	3,557	5,199	1,642	46%

Source: HAM_BoroStats_3.8 - CW_Base_DM.xlsm

B.2 2031 Medium growth compared with 2031 Do-Minimum

Table 53: 2031 Medium growth compared with 2031 Do-Minimum – Borough statistics

	Travel Distance (pcu-km)				Travel Time (pcu-hours)				Average Speed (km/h)				Level of Delay (Delays pcu-hours)			
London Borough	2031 CW DM PM	2031 CW Med PM	Change	% Change	2031 CW DM PM	2031 CW Med PM	Change	% Change	2031 CW DM PM	2031 CW Med PM	Change	% Change	2031 CW DM PM	2031 CW Med PM	Change	% Change
Southwark	102,136	103,927	1,791	2%	6,744	6,998	254	4%	15.1	14.9	-0.3	-2%	3,238	3,423	185	6%
Greenwich	211,080	211,306	226	0%	11,274	11,418	144	1%	18.7	18.5	-0.2	-1%	6,263	6,404	141	2%
City of London	19,780	19,822	42	0%	2,444	2,484	40	2%	8.1	8.0	-0.1	-1%	1,722	1,761	39	2%
Lewisham	95,887	96,147	260	0%	5,740	5,799	59	1%	16.7	16.6	-0.1	-1%	2,574	2,625	51	2%
Hackney	78,947	78,853	-94	0%	5,147	5,161	14	0%	15.3	15.3	-0.1	0%	2,777	2,794	16	1%
Tower Hamlets	134,766	134,419	-347	0%	9,675	9,691	15	0%	13.9	13.9	-0.1	0%	6,154	6,179	25	0%
Lambeth	102,234	102,280	46	0%	6,756	6,765	9	0%	15.1	15.1	0.0	0%	3,710	3,718	8	0%
Camden	77,714	77,715	1	0%	7,108	7,115	7	0%	10.9	10.9	0.0	0%	4,250	4,256	6	0%
Hammersmith and Fulham	62,687	62,631	-56	0%	4,621	4,617	-4	0%	13.6	13.6	0.0	0%	2,797	2,795	-2	0%
Islington	53,468	53,425	-44	0%	3,566	3,563	-3	0%	15.0	15.0	0.0	0%	1,656	1,654	-2	0%
Westminster	134,764	134,801	37	0%	11,370	11,363	-7	0%	11.9	11.9	0.0	0%	7,152	7,143	-9	0%
Wandsworth	116,853	116,832	-21	0%	7,245	7,237	-7	0%	16.1	16.1	0.0	0%	3,997	3,991	-6	0%
Kensington and Chelsea	75,016	74,948	-68	0%	5,044	5,026	-17	0%	14.9	14.9	0.0	0%	2,785	2,769	-15	-1%
Newham	165,448	165,213	-235	0%	8,909	8,857	-52	-1%	18.6	18.7	0.1	0%	5,199	5,154	-46	-1%

Source: HAM_BoroStats_3.8 - CW_DM_Med.xlsm

B.3 2031 Medium growth with Rotherhithe Tunnel Charge (RTC) compared with 2031 Medium growth

Table 54: 2031 Medium growth with Rotherhithe Tunnel Charge (RTC) compared with 2031 Medium growth – Borough Statistics

	Travel Distance (pcu-km)				Travel Time (pcu-hours)				Average Speed (km/h)				Level of Delay (Delays pcu-hours)			
London Borough	2031 CW Med PM	2031 CW Med - RTC PM	Change	% Change	2031 CW Med PM	2031 CW Med - RTC PM	Change	% Change	2031 CW Med PM	2031 CW Med - RTC PM	Change	% Change	2031 CW Med PM	2031 CW Med - RTC PM	Change	% Change
Southwark	103,927	103,328	-600	-1%	6,998	7,042	44	1%	14.9	14.7	-0.2	-1%	3,423	3,492	69	2%
Greenwich	211,306	210,879	-427	0%	11,418	11,217	-201	-2%	18.5	18.8	0.3	2%	6,404	6,225	-179	-3%
City of London	19,822	19,936	114	1%	2,484	2,537	53	2%	8.0	7.9	-0.1	-2%	1,761	1,809	48	3%
Lewisham	96,147	96,266	119	0%	5,799	5,767	-32	-1%	16.6	16.7	0.1	1%	2,625	2,590	-35	-1%
Hackney	78,853	78,920	67	0%	5,161	5,170	10	0%	15.3	15.3	0.0	0%	2,794	2,800	7	0%
Tower Hamlets	134,419	134,503	83	0%	9,691	10,090	399	4%	13.9	13.3	-0.5	-4%	6,179	6,577	398	6%
Lambeth	102,280	102,128	-152	0%	6,765	6,739	-26	0%	15.1	15.2	0.0	0%	3,718	3,697	-21	-1%
Camden	77,715	77,795	80	0%	7,115	7,125	9	0%	10.9	10.9	0.0	0%	4,256	4,263	7	0%
Hammersmith and Fulham	62,631	62,643	11	0%	4,617	4,623	6	0%	13.6	13.6	0.0	0%	2,795	2,800	5	0%
Islington	53,425	53,589	164	0%	3,563	3,582	19	1%	15.0	15.0	0.0	0%	1,654	1,667	13	1%
Westminster	134,801	134,964	162	0%	11,363	11,393	31	0%	11.9	11.8	0.0	0%	7,143	7,168	26	0%
Wandsworth	116,832	116,578	-254	0%	7,237	7,249	11	0%	16.1	16.1	-0.1	0%	3,991	4,010	19	0%
Kensington and Chelsea	74,948	74,945	-2	0%	5,026	5,040	14	0%	14.9	14.9	0.0	0%	2,769	2,784	15	1%
Newham	165,213	165,329	116	0%	8,857	8,732	-125	-1%	18.7	18.9	0.3	2%	5,154	5,025	-128	-2%

Source: HAM_BoroStats_3.8 - CW_Med_RTC.xlsm

B.4 2031 Medium growth with Silvertown Tunnel (ST) compared with 2031 Medium growth

Table 55: 2031 Medium growth with Silvertown Tunnel (ST) compared with 2031 Medium growth – Borough statistics

	Travel Distance (pcu-km)				Travel Time (pcu-hours)				Average Speed (km/h)				Level of Delay (Delays pcu-hours)			
London Borough	2031 CW Med PM	2031 CW Med - ST PM	Change	% Change	2031 CW Med PM	2031 CW Med - ST PM	Change	% Change	2031 CW Med PM	2031 CW Med - ST PM	Change	% Change	2031 CW Med PM	2031 CW Med - ST PM	Change	% Change
Southwark	103,927	103,059	-868	-1%	6,998	6,871	-127	-2%	14.9	15.0	0.1	1%	3,423	3,325	-98	-3%
Greenwich	211,306	220,598	9,293	4%	11,418	11,221	-197	-2%	18.5	19.7	1.2	6%	6,404	6,002	-402	-6%
City of London	19,822	19,717	-104	-1%	2,484	2,450	-34	-1%	8.0	8.0	0.1	1%	1,761	1,731	-30	-2%
Lewisham	96,147	96,094	-54	0%	5,799	5,845	46	1%	16.6	16.4	-0.1	-1%	2,625	2,671	45	2%
Hackney	78,853	80,195	1,343	2%	5,161	5,219	58	1%	15.3	15.4	0.1	1%	2,794	2,827	33	1%
Tower Hamlets	134,419	138,351	3,932	3%	9,691	8,333	-1,357	-14%	13.9	16.6	2.7	20%	6,179	4,780	-1,400	-23%
Lambeth	102,280	102,168	-112	0%	6,765	6,745	-20	0%	15.1	15.1	0.0	0%	3,718	3,701	-16	0%
Camden	77,715	77,697	-18	0%	7,115	7,102	-13	0%	10.9	10.9	0.0	0%	4,256	4,244	-12	0%
Hammersmith and Fulham	62,631	62,644	13	0%	4,617	4,613	-3	0%	13.6	13.6	0.0	0%	2,795	2,791	-4	0%
Islington	53,425	53,580	155	0%	3,563	3,584	21	1%	15.0	14.9	0.0	0%	1,654	1,670	16	1%
Westminster	134,801	134,540	-262	0%	11,363	11,318	-45	0%	11.9	11.9	0.0	0%	7,143	7,107	-36	-1%
Wandsworth	116,832	116,728	-104	0%	7,237	7,257	20	0%	16.1	16.1	-0.1	0%	3,991	4,014	23	1%
Kensington and Chelsea	74,948	74,900	-48	0%	5,026	5,020	-7	0%	14.9	14.9	0.0	0%	2,769	2,764	-5	0%
Newham	165,213	169,020	3,807	2%	8,857	9,705	848	10%	18.7	17.4	-1.2	-7%	5,154	5,872	718	14%

Source: HAM_BoroStats_3.8 - CW_Med_ST.xlsm

B.5 2031 Medium growth with Silvertown Tunnel and Rotherhithe Tunnel Charge (STRC) compared with 2031 Medium growth

Table 56: 2031 Medium growth with Silvertown Tunnel and Rotherhithe Tunnel Charge (STRC) compared with 2031 Medium growth – Borough statistics

	Travel Distance (pcu-km)				Travel Time (pcu-hours)				Average Speed (km/h)				Level of Delay (Delays pcu-hours)			
London Borough	2031 CW Med PM	2031 CW Med - STRC PM	Change	% Change	2031 CW Med PM	2031 CW Med - STRC PM	Change	% Change	2031 CW Med PM	2031 CW Med - STRC PM	Change	% Change	2031 CW Med PM	2031 CW Med - STRC PM	Change	% Change
Southwark	103,927	102,371	-1,556	-1%	6,998	6,876	-122	-2%	14.9	14.9	0.0	0%	3,423	3,358	-65	-2%
Greenwich	211,306	220,793	9,487	4%	11,418	11,353	-65	-1%	18.5	19.4	0.9	5%	6,404	6,152	-252	-4%
City of London	19,822	19,800	-22	0%	2,484	2,486	2	0%	8.0	8.0	0.0	0%	1,761	1,763	2	0%
Lewisham	96,147	96,256	108	0%	5,799	5,843	44	1%	16.6	16.5	-0.1	-1%	2,625	2,666	41	2%
Hackney	78,853	80,100	1,247	2%	5,161	5,220	59	1%	15.3	15.3	0.1	0%	2,794	2,829	35	1%
Tower Hamlets	134,419	137,454	3,035	2%	9,691	8,209	-1,482	-15%	13.9	16.7	2.9	21%	6,179	4,680	-1,499	-24%
Lambeth	102,280	101,932	-348	0%	6,765	6,717	-49	-1%	15.1	15.2	0.1	0%	3,718	3,681	-37	-1%
Camden	77,715	77,774	59	0%	7,115	7,128	13	0%	10.9	10.9	0.0	0%	4,256	4,267	11	0%
Hammersmith and Fulham	62,631	62,605	-26	0%	4,617	4,614	-3	0%	13.6	13.6	0.0	0%	2,795	2,793	-2	0%
Islington	53,425	53,719	294	1%	3,563	3,600	37	1%	15.0	14.9	-0.1	0%	1,654	1,680	26	2%
Westminster	134,801	134,681	-120	0%	11,363	11,336	-26	0%	11.9	11.9	0.0	0%	7,143	7,121	-22	0%
Wandsworth	116,832	116,691	-141	0%	7,237	7,249	12	0%	16.1	16.1	0.0	0%	3,991	4,007	16	0%
Kensington and Chelsea	74,948	74,918	-30	0%	5,026	5,027	1	0%	14.9	14.9	0.0	0%	2,769	2,772	2	0%
Newham	165,213	170,334	5,121	3%	8,857	9,713	856	10%	18.7	17.5	-1.1	-6%	5,154	5,861	708	14%

Source: HAM_BoroStats_3.8 - CW_Med_STRC.xlsm

B.6 2031 Medium growth (low-car) with CS4 Option 1 compared with 2031 Medium growth

Table 57: 2031 Medium growth (low-car) with CS4 Option 1 compared with 2031 Medium growth – Borough statistics

	Travel Distance (pcu-km)				Travel Time (pcu-hours)				Average Speed (km/h)				Level of Delay (Delays pcu-hours)			
London Borough	2031 CW Med PM	2031 CW CS4 Opt 1 PM	Change	% Change	2031 CW Med PM	2031 CW CS4 Opt 1 PM	Change	% Change	2031 CW Med PM	2031 CW CS4 Opt 1 PM	Change	% Change	2031 CW Med PM	2031 CW CS4 Opt 1 PM	Change	% Change
Southwark	103,927	104,063	135	0%	6,998	7,257	259	4%	14.9	14.3	-0.5	-3%	3,423	3,654	231	7%
Greenwich	211,306	210,508	-797	0%	11,418	11,355	-63	-1%	18.5	18.5	0.0	0%	6,404	6,365	-39	-1%
City of London	19,822	19,724	-97	0%	2,484	2,423	-61	-2%	8.0	8.1	0.2	2%	1,761	1,704	-57	-3%
Lewisham	96,147	95,918	-229	0%	5,799	5,687	-111	-2%	16.6	16.9	0.3	2%	2,625	2,513	-112	-4%
Hackney	78,853	78,820	-33	0%	5,161	5,139	-22	0%	15.3	15.3	0.1	0%	2,794	2,772	-21	-1%
Tower Hamlets	134,419	134,525	105	0%	9,691	9,757	66	1%	13.9	13.8	-0.1	-1%	6,179	6,242	63	1%
Lambeth	102,280	102,279	-2	0%	6,765	6,786	21	0%	15.1	15.1	0.0	0%	3,718	3,739	21	1%
Camden	77,715	77,660	-55	0%	7,115	7,101	-14	0%	10.9	10.9	0.0	0%	4,256	4,244	-12	0%
Hammersmith and Fulham	62,631	62,649	18	0%	4,617	4,615	-1	0%	13.6	13.6	0.0	0%	2,795	2,792	-2	0%
Islington	53,425	53,469	44	0%	3,563	3,566	3	0%	15.0	15.0	0.0	0%	1,654	1,656	2	0%
Westminster	134,801	134,750	-51	0%	11,363	11,357	-5	0%	11.9	11.9	0.0	0%	7,143	7,140	-3	0%
Wandsworth	116,832	116,709	-124	0%	7,237	7,340	102	1%	16.1	15.9	-0.2	-1%	3,991	4,097	106	3%
Kensington and Chelsea	74,948	74,913	-35	0%	5,026	5,035	8	0%	14.9	14.9	0.0	0%	2,769	2,779	10	0%
Newham	165,213	165,338	125	0%	8,857	8,804	-53	-1%	18.7	18.8	0.1	1%	5,154	5,098	-55	-1%

Source: HAM_BoroStats_3.8 - CW_Med_CS4Op1_lowcar_Optimised.xlsm

B.7 2031 Medium growth (low-car) with CS4 Option 2 compared with 2031 Medium growth

Table 58: 2031 Medium growth (low-car) with CS4 Option 2 compared with 2031 Medium growth – Borough statistics

	Travel Distance (pcu-km)				Travel Time (pcu-hours)				Average Speed (km/h)				Level of Delay (Delays pcu-hours)			
London Borough	2031 CW Med PM	2031 CW CS4 Opt 2 PM	Change	% Change	2031 CW Med PM	2031 CW CS4 Opt 2 PM	Change	% Change	2031 CW Med PM	2031 CW CS4 Opt 2 PM	Change	% Change	2031 CW Med PM	2031 CW CS4 Opt 2 PM	Change	% Change
Southwark	103,927	103,957	30	0%	6,998	7,024	26	0%	14.9	14.8	-0.1	0%	3,423	3,419	-4	0%
Greenwich	211,306	210,631	-675	0%	11,418	11,395	-23	0%	18.5	18.5	0.0	0%	6,404	6,402	-3	0%
City of London	19,822	19,720	-102	-1%	2,484	2,413	-71	-3%	8.0	8.2	0.2	2%	1,761	1,693	-67	-4%
Lewisham	96,147	96,675	528	1%	5,799	5,752	-47	-1%	16.6	16.8	0.2	1%	2,625	2,550	-75	-3%
Hackney	78,853	78,918	65	0%	5,161	5,147	-14	0%	15.3	15.3	0.1	0%	2,794	2,778	-16	-1%
Tower Hamlets	134,419	135,206	787	1%	9,691	9,791	100	1%	13.9	13.8	-0.1	0%	6,179	6,255	76	1%
Lambeth	102,280	102,311	30	0%	6,765	6,767	2	0%	15.1	15.1	0.0	0%	3,718	3,719	1	0%
Camden	77,715	77,656	-59	0%	7,115	7,093	-22	0%	10.9	10.9	0.0	0%	4,256	4,237	-19	0%
Hammersmith and Fulham	62,631	62,631	-1	0%	4,617	4,617	1	0%	13.6	13.6	0.0	0%	2,795	2,796	1	0%
Islington	53,425	53,448	23	0%	3,563	3,562	-1	0%	15.0	15.0	0.0	0%	1,654	1,653	-1	0%
Westminster	134,801	134,753	-48	0%	11,363	11,384	21	0%	11.9	11.8	0.0	0%	7,143	7,165	23	0%
Wandsworth	116,832	116,795	-37	0%	7,237	7,240	2	0%	16.1	16.1	0.0	0%	3,991	3,995	3	0%
Kensington and Chelsea	74,948	74,929	-19	0%	5,026	5,036	10	0%	14.9	14.9	0.0	0%	2,769	2,780	10	0%
Newham	165,213	165,054	-159	0%	8,857	8,877	20	0%	18.7	18.6	-0.1	0%	5,154	5,174	20	0%

Source: HAM_BoroStats_3.8 - CW_Med_CS4Op2_lowcar_Optimised.xlsm

B.8 2031 Medium growth (low-car) with CS4 Option 2 compared with 2031 Medium growth (low-car) with CS4 Option 1

Table 59: 2031 Medium growth (low-car) with CS4 Option 2 compared with 2031 Medium growth – Borough statistics

	Travel Distance (pcu-km)				Travel Time (pcu-hours)				Average Speed (km/h)				Level of Delay (Delays pcu-hours)			
London Borough	2031 CW CS4 Opt 1 PM	2031 CW CS4 Opt 2 PM	Change	% Change	2031 CW CS4 Opt 1 PM	2031 CW CS4 Opt 2 PM	Change	% Change	2031 CW CS4 Opt 1 PM	2031 CW CS4 Opt 2 PM	Change	% Change	2031 CW CS4 Opt 1 PM	2031 CW CS4 Opt 2 PM	Change	% Change
Southwark	104,063	103,957	-106	0%	7,257	7,024	-233	-3%	14.3	14.8	0.5	3%	3,654	3,419	-235	-6%
Greenwich	210,508	210,631	123	0%	11,355	11,395	39	0%	18.5	18.5	-0.1	0%	6,365	6,402	37	1%
City of London	19,724	19,720	-5	0%	2,423	2,413	-11	0%	8.1	8.2	0.0	0%	1,704	1,693	-11	-1%
Lewisham	95,918	96,675	757	1%	5,687	5,752	64	1%	16.9	16.8	-0.1	0%	2,513	2,550	37	1%
Hackney	78,820	78,918	98	0%	5,139	5,147	8	0%	15.3	15.3	0.0	0%	2,772	2,778	6	0%
Tower Hamlets	134,525	135,206	681	1%	9,757	9,791	34	0%	13.8	13.8	0.0	0%	6,242	6,255	13	0%
Lambeth	102,279	102,311	32	0%	6,786	6,767	-19	0%	15.1	15.1	0.0	0%	3,739	3,719	-20	-1%
Camden	77,660	77,656	-5	0%	7,101	7,093	-8	0%	10.9	10.9	0.0	0%	4,244	4,237	-8	0%
Hammersmith and Fulham	62,649	62,631	-19	0%	4,615	4,617	2	0%	13.6	13.6	0.0	0%	2,792	2,796	3	0%
Islington	53,469	53,448	-21	0%	3,566	3,562	-4	0%	15.0	15.0	0.0	0%	1,656	1,653	-3	0%
Westminster	134,750	134,753	3	0%	11,357	11,384	26	0%	11.9	11.8	0.0	0%	7,140	7,165	26	0%
Wandsworth	116,709	116,795	86	0%	7,340	7,240	-100	-1%	15.9	16.1	0.2	1%	4,097	3,995	-102	-2%
Kensington and Chelsea	74,913	74,929	16	0%	5,035	5,036	1	0%	14.9	14.9	0.0	0%	2,779	2,780	1	0%
Newham	165,338	165,054	-284	0%	8,804	8,877	73	1%	18.8	18.6	-0.2	-1%	5,098	5,174	75	1%

Source: HAM_BoroStats_3.8 - CW_Op2_minus_Op1_lowcar_Optimised.xlsm

B.9 2031 Medium growth (low-car) with CS4 Option 3 compared with 2031 Medium growth

Table 60: 2031 Medium growth (low-car) with CS4 Option 3 compared with 2031 Medium growth – Borough statistics

	Travel Distance (pcu-km)				Travel Time (pcu-hours)				Average Speed (km/h)				Level of Delay (Delays pcu-hours)			
London Borough	2031 CW Med PM	2031 CW CS4 Opt 3 PM	Change	% Change	2031 CW Med PM	2031 CW CS4 Opt 3 PM	Change	% Change	2031 CW Med PM	2031 CW CS4 Opt 3 PM	Change	% Change	2031 CW Med PM	2031 CW CS4 Opt 3 PM	Change	% Change
Southwark	103,927	102,456	-1,472	-1%	6,998	7,660	662	9%	14.9	13.4	-1.5	-10%	3,423	4,122	699	20%
Greenwich	211,306	210,498	-808	0%	11,418	11,388	-30	0%	18.5	18.5	0.0	0%	6,404	6,393	-11	0%
City of London	19,822	19,809	-13	0%	2,484	2,472	-12	0%	8.0	8.0	0.0	0%	1,761	1,749	-12	-1%
Lewisham	96,147	96,221	74	0%	5,799	5,771	-28	0%	16.6	16.7	0.1	1%	2,625	2,592	-33	-1%
Hackney	78,853	78,816	-37	0%	5,161	5,137	-24	0%	15.3	15.3	0.1	0%	2,794	2,771	-23	-1%
Tower Hamlets	134,419	134,038	-381	0%	9,691	9,649	-41	0%	13.9	13.9	0.0	0%	6,179	6,151	-28	0%
Lambeth	102,280	102,212	-69	0%	6,765	6,755	-10	0%	15.1	15.1	0.0	0%	3,718	3,710	-7	0%
Camden	77,715	77,715	1	0%	7,115	7,143	28	0%	10.9	10.9	0.0	0%	4,256	4,284	28	1%
Hammersmith and Fulham	62,631	62,643	11	0%	4,617	4,614	-2	0%	13.6	13.6	0.0	0%	2,795	2,792	-3	0%
Islington	53,425	53,446	21	0%	3,563	3,568	5	0%	15.0	15.0	0.0	0%	1,654	1,658	5	0%
Westminster	134,801	134,757	-44	0%	11,363	11,349	-14	0%	11.9	11.9	0.0	0%	7,143	7,130	-12	0%
Wandsworth	116,832	116,754	-79	0%	7,237	7,230	-7	0%	16.1	16.1	0.0	0%	3,991	3,986	-6	0%
Kensington and Chelsea	74,948	74,949	2	0%	5,026	5,035	9	0%	14.9	14.9	0.0	0%	2,769	2,778	9	0%
Newham	165,213	165,073	-141	0%	8,857	8,772	-85	-1%	18.7	18.8	0.2	1%	5,154	5,073	-80	-2%

Source: HAM_BoroStats_3.8 - CW_Med_CS4Op3_lowcar.xlsm

B.10 2031 Medium growth (low-car) with CS4 Option 4 compared with 2031 Medium growth

Table 61: 2031 Medium growth (low-car) with CS4 Option 4 compared with 2031 Medium growth – Borough statistics

	Travel Distance (pcu-km)				Travel Time (pcu-hours)				Average Speed (km/h)				Level of Delay (Delays pcu-hours)			
London Borough	2031 CW Med PM	2031 CW CS4 Opt 4 PM	Change	% Change	2031 CW Med PM	2031 CW CS4 Opt 4 PM	Change	% Change	2031 CW Med PM	2031 CW CS4 Opt 4 PM	Change	% Change	2031 CW Med PM	2031 CW CS4 Opt 4 PM	Change	% Change
Southwark	103,927	102,727	-1,200	-1%	6,998	7,630	632	9%	14.9	13.5	-1.4	-9%	3,423	4,073	650	19%
Greenwich	211,306	211,135	-170	0%	11,418	11,739	321	3%	18.5	18.0	-0.5	-3%	6,404	6,725	321	5%
City of London	19,822	19,711	-111	-1%	2,484	2,471	-13	-1%	8.0	8.0	0.0	0%	1,761	1,751	-10	-1%
Lewisham	96,147	96,573	426	0%	5,799	5,778	-21	0%	16.6	16.7	0.1	1%	2,625	2,581	-44	-2%
Hackney	78,853	78,871	18	0%	5,161	5,172	11	0%	15.3	15.2	0.0	0%	2,794	2,803	9	0%
Tower Hamlets	134,419	132,716	-1,703	-1%	9,691	9,705	14	0%	13.9	13.7	-0.2	-1%	6,179	6,237	58	1%
Lambeth	102,280	102,183	-98	0%	6,765	6,759	-6	0%	15.1	15.1	0.0	0%	3,718	3,715	-3	0%
Camden	77,715	77,709	-5	0%	7,115	7,099	-16	0%	10.9	10.9	0.0	0%	4,256	4,241	-15	0%
Hammersmith and Fulham	62,631	62,640	8	0%	4,617	4,613	-4	0%	13.6	13.6	0.0	0%	2,795	2,791	-4	0%
Islington	53,425	53,491	66	0%	3,563	3,571	8	0%	15.0	15.0	0.0	0%	1,654	1,660	6	0%
Westminster	134,801	134,770	-31	0%	11,363	11,368	5	0%	11.9	11.9	0.0	0%	7,143	7,150	7	0%
Wandsworth	116,832	116,708	-124	0%	7,237	7,212	-25	0%	16.1	16.2	0.0	0%	3,991	3,970	-21	-1%
Kensington and Chelsea	74,948	74,931	-16	0%	5,026	5,007	-20	0%	14.9	15.0	0.1	0%	2,769	2,750	-19	-1%
Newham	165,213	164,997	-216	0%	8,857	8,813	-44	-1%	18.7	18.7	0.1	0%	5,154	5,113	-41	-1%

Source: HAM_BoroStats_3.8 - CW_Med_CS4Op4_lowcar.xlsm

B.11 2041 'Strategic Full' compared with 2041 'Maximum' growth

Table 62: 2041 'Strategic Full' compared with 2041 'Maximum' growth – Borough statistics

	Travel Distance (pcu-km)				Travel Time (pcu-hours)				Average Speed (km/h)				Level of Delay (Delays pcu-hours)			
London Borough	2041 Max	2041 Strat Full	Change	% Change	2041 Max	2041 Strat Full	Change	% Change	2041 Max	2041 Strat Full	Change	% Change	2041 Max	2041 Strat Full	Change	% Change
Southwark	107,412	106,850	-561	-1%	7,579	7,672	93	1%	14.2	13.9	-0.2	-2%	3,879	3,964	85	2%
Greenwich	220,115	218,674	-1,441	-1%	13,118	12,911	-208	-2%	16.8	16.9	0.2	1%	7,835	7,672	-163	-2%
City of London	19,919	20,063	144	1%	2,638	2,662	25	1%	7.6	7.5	0.0	0%	1,907	1,928	21	1%
Lewisham	99,368	98,774	-594	-1%	6,215	6,076	-139	-2%	16.0	16.3	0.3	2%	2,925	2,801	-125	-4%
Hackney	81,011	80,277	-734	-1%	5,546	5,405	-140	-3%	14.6	14.9	0.2	2%	3,109	2,993	-115	-4%
Tower Hamlets	138,192	139,966	1,774	1%	11,574	11,626	53	0%	11.9	12.0	0.1	1%	7,938	7,946	8	0%
Lambeth	104,739	104,411	-328	0%	7,291	7,199	-92	-1%	14.4	14.5	0.1	1%	4,160	4,080	-81	-2%
Camden	80,724	80,404	-319	0%	8,045	7,805	-240	-3%	10.0	10.3	0.3	3%	5,063	4,837	-226	-4%
Hammersmith and Fulham	64,381	64,183	-198	0%	5,047	5,003	-44	-1%	12.8	12.8	0.1	1%	3,164	3,126	-38	-1%
Islington	55,507	54,979	-529	-1%	3,856	3,790	-66	-2%	14.4	14.5	0.1	1%	1,870	1,824	-47	-3%
Westminster	137,518	137,248	-270	0%	12,447	12,293	-154	-1%	11.0	11.2	0.1	1%	8,135	7,990	-146	-2%
Wandsworth	118,966	118,463	-502	0%	7,693	7,604	-89	-1%	15.5	15.6	0.1	1%	4,379	4,307	-72	-2%
Kensington and Chelsea	76,793	76,630	-163	0%	5,571	5,521	-50	-1%	13.8	13.9	0.1	1%	3,258	3,212	-45	-1%
Newham	169,796	169,506	-290	0%	10,157	10,095	-62	-1%	16.7	16.8	0.1	0%	6,296	6,246	-50	-1%

Source: HAM_BoroStats_3.8 - 2041SF minus 2041Max.xlsm

B.12 2041 'Strategic Full' compared with CS4 Option 2 with 2031 Medium growth

Table 63: 2041 'Strategic Full' compared with CS4 Option 2 with 2031 Medium growth – Borough statistics

	Travel Distance (pcu-km)				Travel Time (pcu-hours)				Average Speed (km/h)				Level of Delay (Delays pcu-hours)			
London Borough	2041 Strat Full	2031 CW CS4 Opt 2 PM	Change	% Change	2041 Strat Full	2031 CW CS4 Opt 2 PM	Change	% Change	2041 Strat Full	2031 CW CS4 Opt 2 PM	Change	% Change	2041 Strat Full	2031 CW CS4 Opt 2 PM	Change	% Change
Southwark	103,604	106,850	3,246	3%	7,040	7,672	632	9%	14.7	13.9	-0.8	-5%	3,452	3,964	512	15%
Greenwich	210,481	218,674	8,193	4%	11,337	12,911	1,573	14%	18.6	16.9	-1.6	-9%	6,350	7,672	1,322	21%
City of London	19,720	20,063	343	2%	2,412	2,662	250	10%	8.2	7.5	-0.6	-8%	1,693	1,928	235	14%
Lewisham	95,951	98,774	2,823	3%	5,668	6,076	408	7%	16.9	16.3	-0.7	-4%	2,494	2,801	306	12%
Hackney	78,781	80,277	1,496	2%	5,145	5,405	261	5%	15.3	14.9	-0.5	-3%	2,780	2,993	213	8%
Tower Hamlets	134,839	139,966	5,126	4%	9,707	11,626	1,919	20%	13.9	12.0	-1.9	-13%	6,181	7,946	1,764	29%
Lambeth	102,279	104,411	2,133	2%	6,761	7,199	437	6%	15.1	14.5	-0.6	-4%	3,714	4,080	365	10%
Camden	77,727	80,404	2,678	3%	7,154	7,805	650	9%	10.9	10.3	-0.6	-5%	4,294	4,837	543	13%
Hammersmith and Fulham	62,638	64,183	1,545	2%	4,622	5,003	381	8%	13.6	12.8	-0.7	-5%	2,800	3,126	326	12%
Islington	53,484	54,979	1,495	3%	3,556	3,790	234	7%	15.0	14.5	-0.5	-4%	1,645	1,824	178	11%
Westminster	134,731	137,248	2,517	2%	11,346	12,293	947	8%	11.9	11.2	-0.7	-6%	7,129	7,990	861	12%
Wandsworth	116,898	118,463	1,565	1%	7,240	7,604	364	5%	16.1	15.6	-0.6	-4%	3,991	4,307	316	8%
Kensington and Chelsea	74,939	76,630	1,691	2%	5,037	5,521	484	10%	14.9	13.9	-1.0	-7%	2,780	3,212	432	16%
Newham	165,338	169,506	4,168	3%	8,949	10,095	1,146	13%	18.5	16.8	-1.7	-9%	5,243	6,246	1,004	19%

Source: HAM_BoroStats_3.8 - 2041SF minus 2031SL.xlsm

C. Railplan Bus Strategy Route Details

Routes 1, 199, 225 and P12 have been rerouted from Lower Road to Deal Porters Way (new High Street) as shown below.

Figure 160: Reference Case High Street bus routing

Figure 161: Bus Main Test High Street routing

The following diagrams show the change in routing for the 188, 199, 381 and 415 routes.

Figure 162: Reference Case 188 route

Figure 163: Bus Main Test 188 route

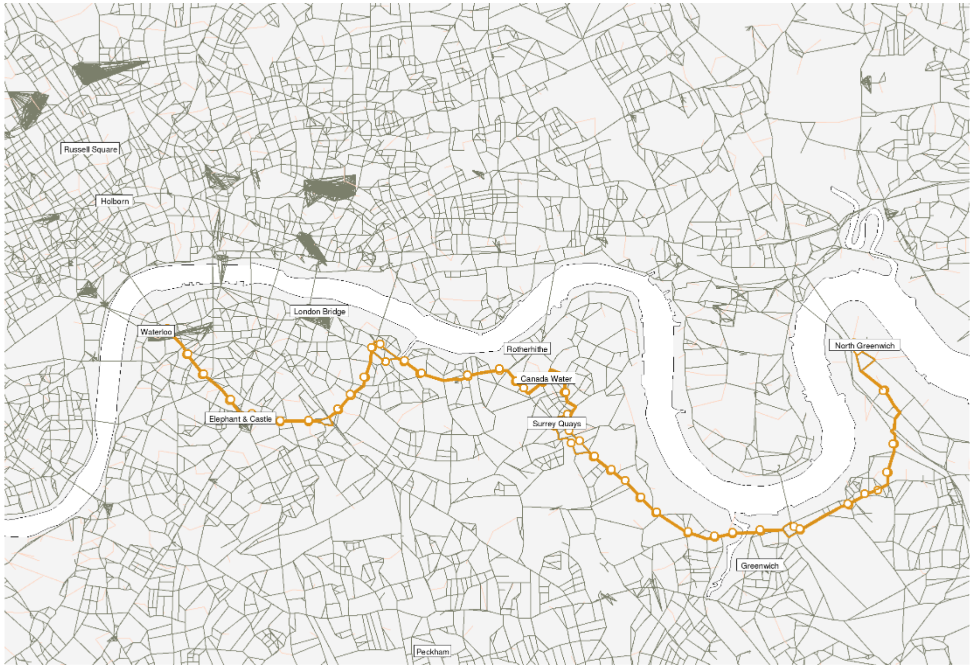


Figure 164: Reference Case 199 route

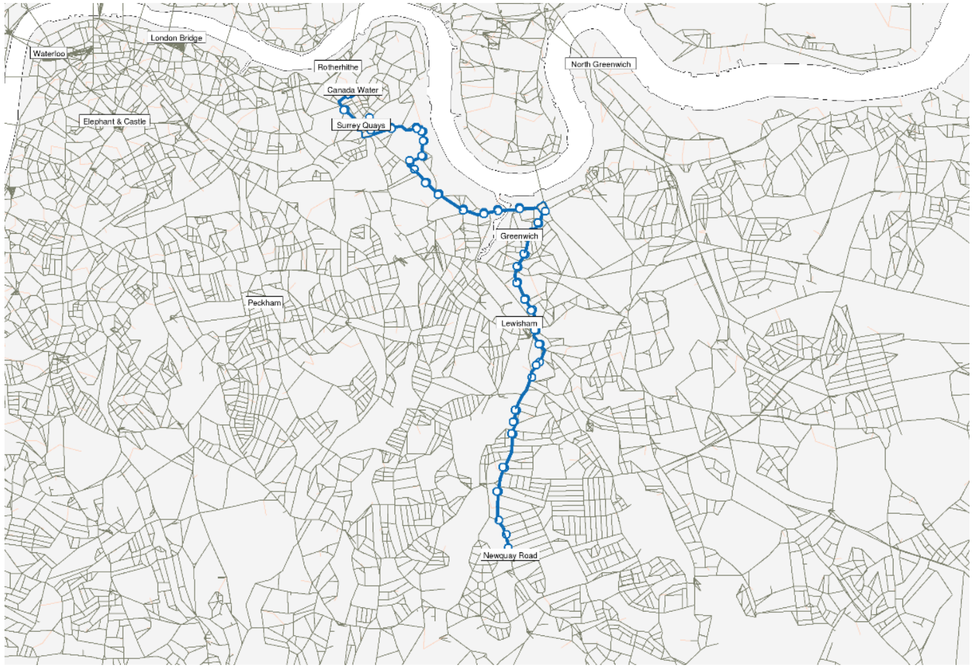


Figure 165: Bus Main Test 199 route

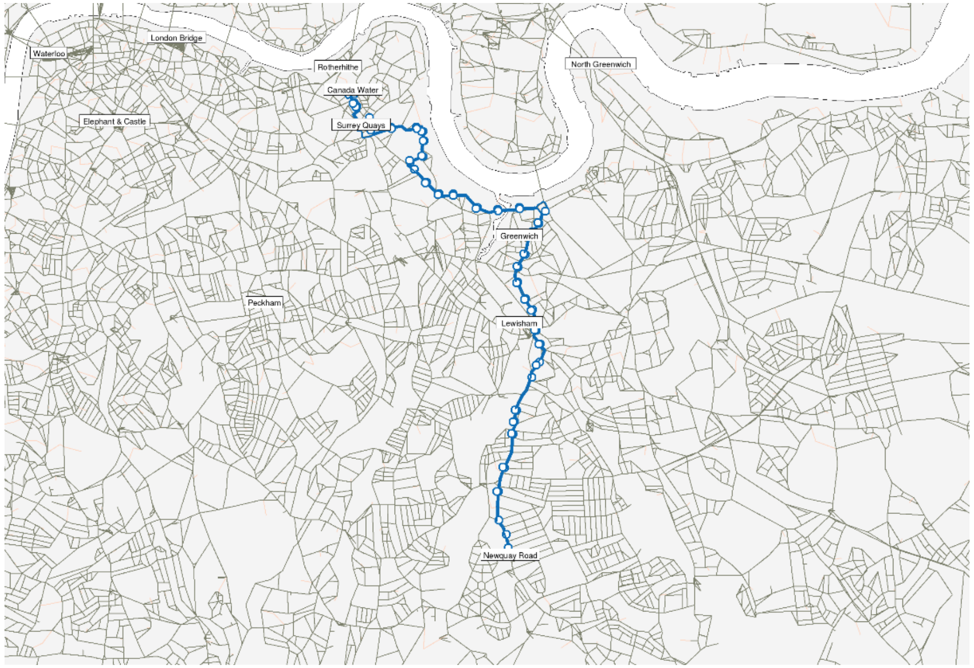


Figure 166: Reference Case 381 route

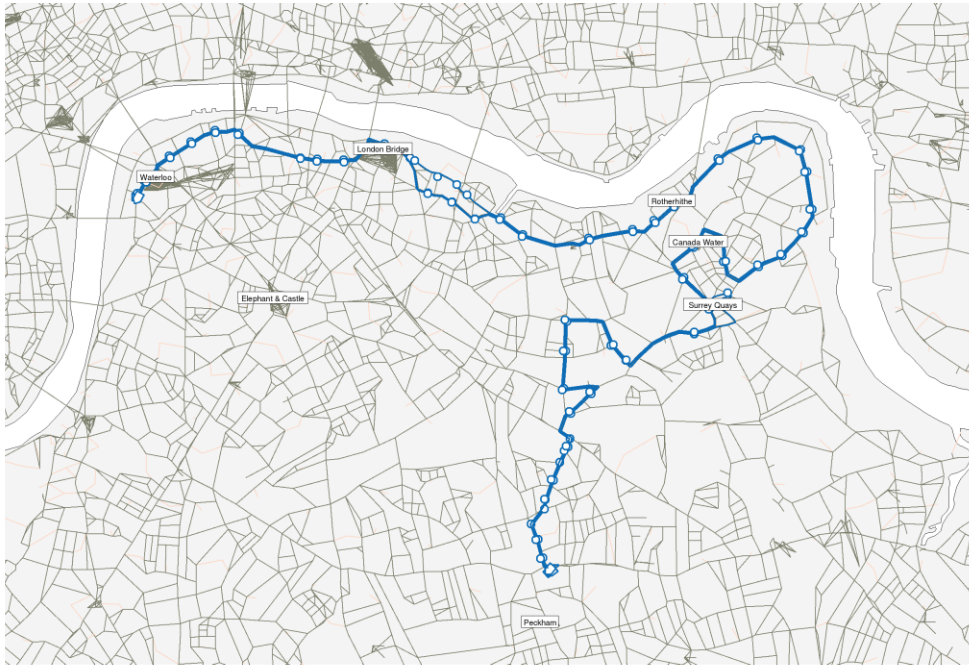


Figure 167: Bus Main Test 381 route

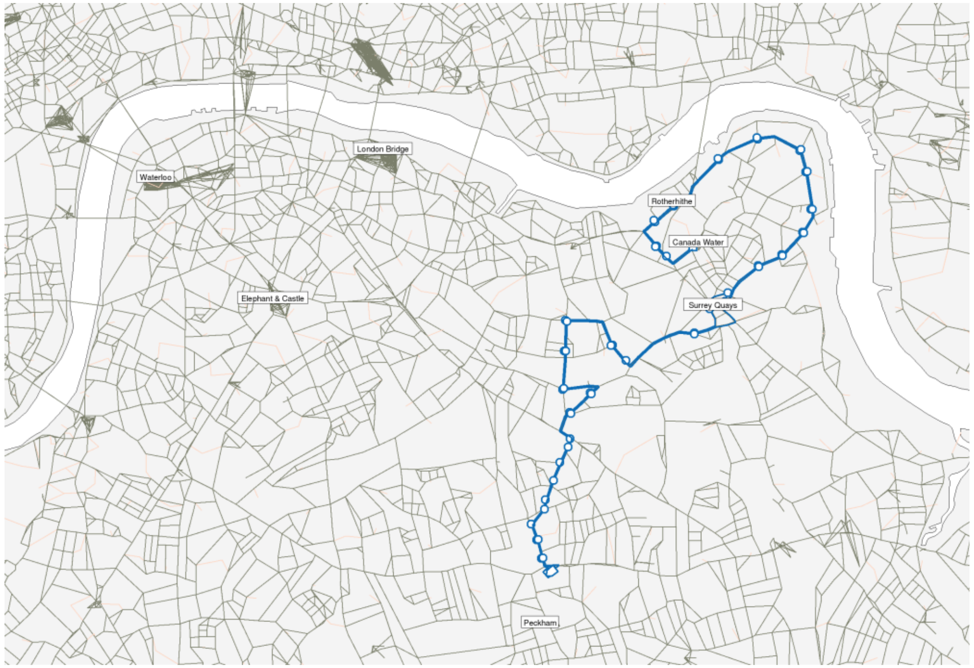


Figure 168: Reference Case 415 route

Figure 169: Bus Main Test 415 route

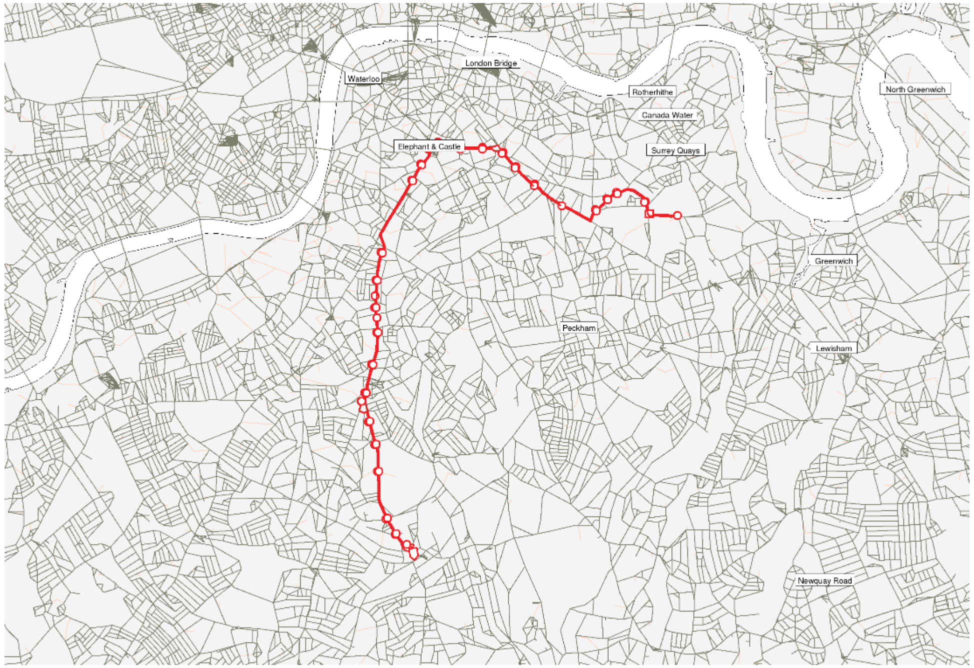


Figure 170: Bus Ma Test – Route A

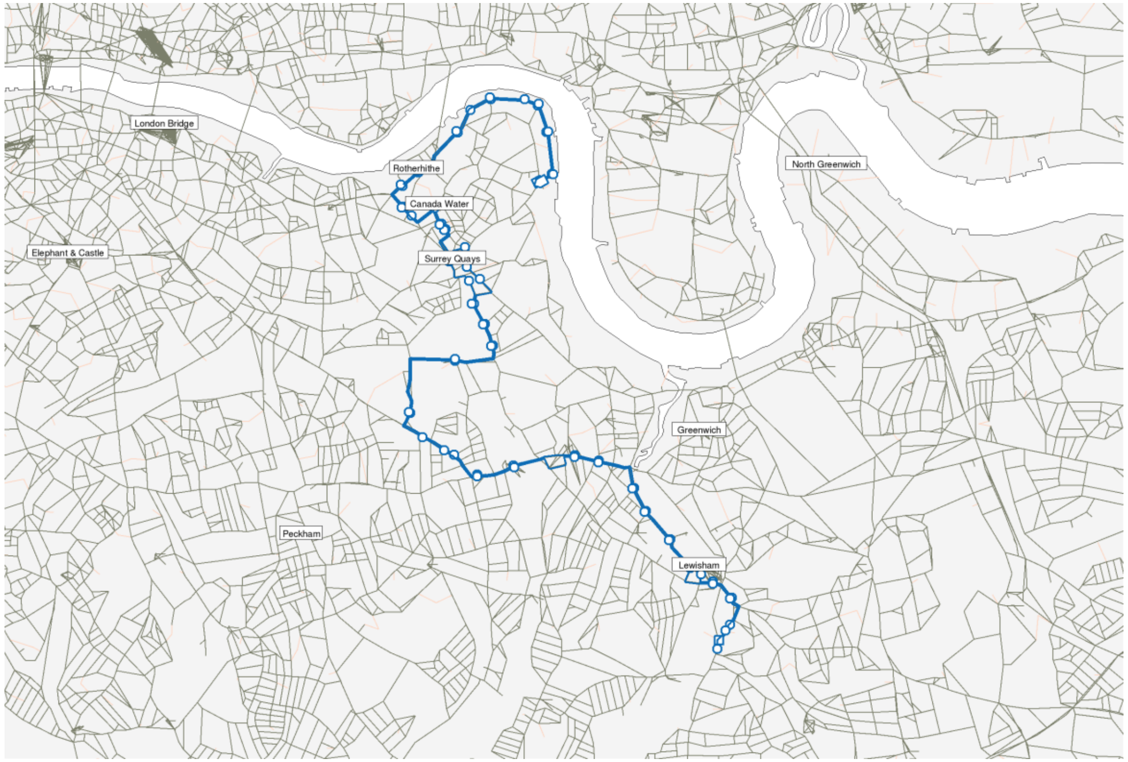


Figure 171: Bus Main Test – Route B

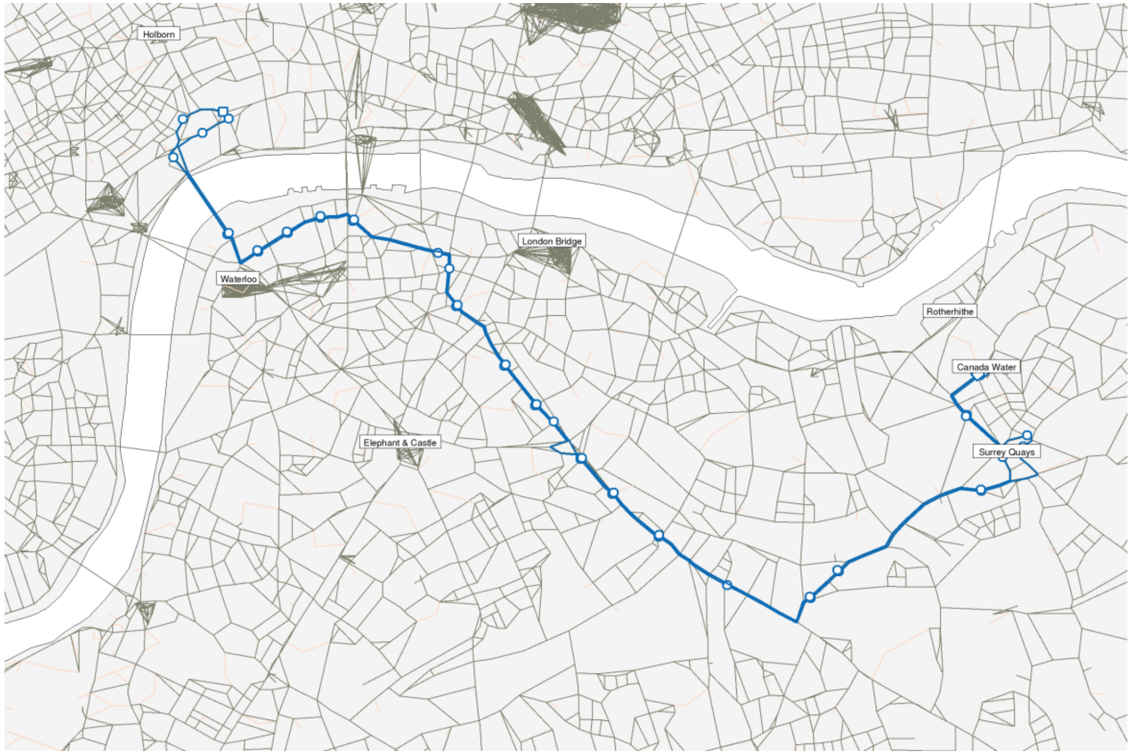
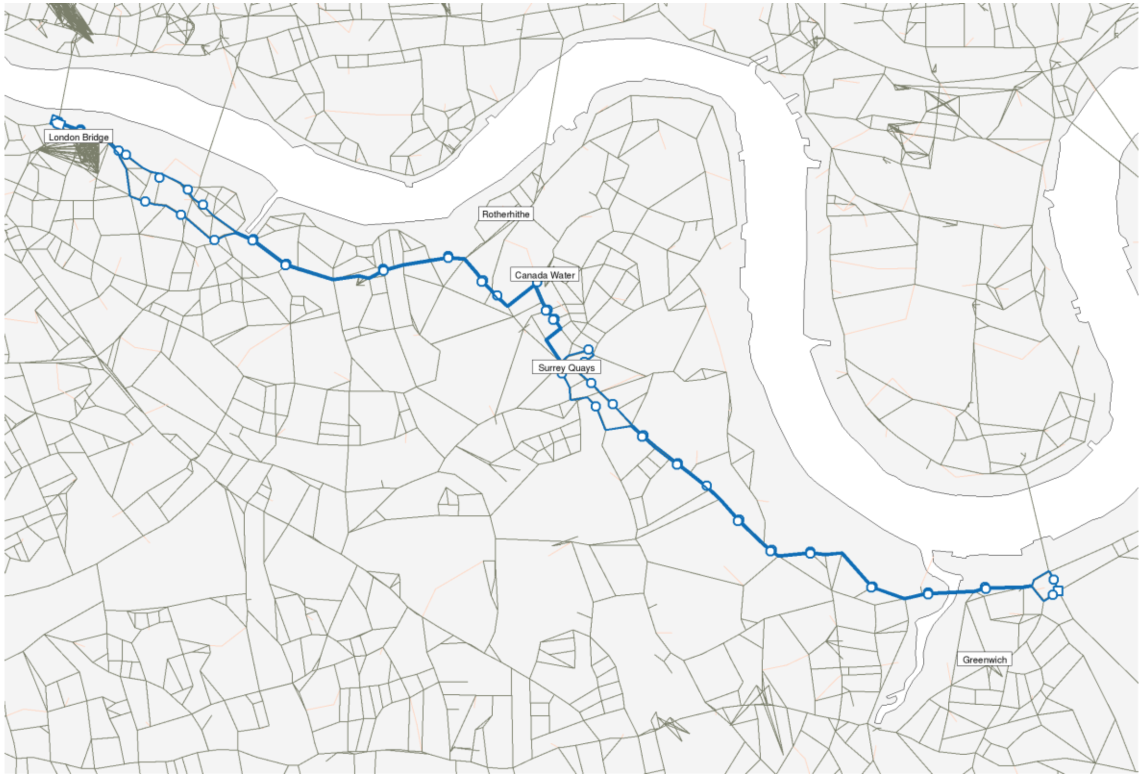


Figure 172: Bus Main Test – Route C



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