Transport for London

East London Pedestrian and Cycling River Crossings

Pedestrian Demand forecasting Report

Date: June 2017

Version: Draft v1.0

CONTENTS

Glossary

BCA	TfL **Business Case Assistant** – this includes a Journey Time Calculator tool from which standard annualisation factors are taken
FALP	The **Further Alterations to the London Plan** was published as the updated 2015 London Plan in March 2015 following public consultation and a full Examination in Public. From this date these alterations are operative as formal alterations to the London Plan (the Mayor's spatial development strategy) and form part of the development plan for London.
GJT	**Generalised Journey Time** - a measure of perceived journey time including other parameters such as monetary cost and user preferences
LTS	**London Transportation Studies** – a strategic transport model of London used to prepare forecasts of growth in total travel, change in travel patterns, the transport mode chosen and the routing of trips through the road and public transport networks
RBODS	**River Bus Origin Destination Survey** – a survey conducted on London's scheduled river bus surveys to record the journeys of all passengers on the surveyed days
RODS	To assess capacity on London Underground trains, the line loadings need to be analysed. **Rolling Origin and Destination Survey** data is collected by London Underground to model the levels of passengers on different sections of line.
TTW	**Travel to Work** – datasets on commuting travel obtained from the 2011 census

1. Introduction

Scope of this report

1.1. Transport for London (TfL) is proposing a new river crossing between Rotherhithe and Canary Wharf near to the location of the cross-river ferry service between Nelson Dock pier (at the Hilton Doubletree hotel) in Rotherhithe and Canary Wharf pier.

1.2. This report summarises the current best estimate of pedestrian demand for a new or enhanced crossing in this location. The demand analysis draws on several sources of forecasting.

1.3. Firstly, TfL have employed internal walking demand analysis to provide estimates of demand for this crossing using bespoke spreadsheet forecasting model, which was originally developed by Jacobs and used in 2010 for a similar study in the same location, and was subsequently updated to estimate likely walking demand for a number of proposed river crossings.

1.4. The new crossing is also included as part of a package of measures assessed in strategic modelling undertaken as part of the emerging Isle of Dogs Opportunity Area Planning Framework. While the full analysis of this modelling is still being reviewed and will likely be updated, the findings in relation to the proposed river crossing are not expected to change significantly and can be scaled to be comparable with the other forecasts.

1.5. TfL commissioned Systra to undertake Stated Preference and Stated Intention surveys with existing walking and cycling river crossing users in east London, non-users living in proximity to the crossings, and public transport passengers currently making one-stop trips on the Jubilee line between Canada Water and Canary Wharf.

Structure of this report

1.6. Chapter 2 of this report describes pedestrian movement in the study area in the base year (2015). An overview of the different forecasting methods and how they complement each other is then presented in chapter 3. In the subsequent three chapters 4-6, the findings of each of the demand forecasting methods. The final chapter 7 brings together the findings of the different forecasting methods and the overall conclusions.

2. Baseline demand (2015)

2.1. There a number of data sources that together provide a relatively comprehensive overview of baseline travel demand around the Isle of Dogs.

2.2. An excellent overview of the spatial distribution of commuting patterns is available because there are two independent data sources, namely the 2011 census travel to work database and the Canary Wharf Travel Survey (CWTS). Analysis of the 2011 data shows the two sources validate each other well in the local area.

2.3. There is less information on non-commuting travel demand but the recent user surveys have been used to determine the proportion of commute and non-commute demand at individual crossings. There is also a comprehensive set of count data on all of the public transport and walk/cycle links over the river.

Travel to work commuting patterns

2.4. The baseline matrix of commuting trips is sourced from the census 2011 Travel to Work dataset, with a 2011-2015 growth factor applied. Within the core walking study area, there are an estimated total of 262 daily commuting trips that cross the river on foot in 2015. The definition of walking for the purpose of this analysis includes trips using the river bus or Emirate Air Line to cross the river.

2.5. Figure 2-1shows the core walk model study area, by total commute walk trip origins, and Figure 2-2 by walk trip destinations.

Figure 2-1 Cross-river walk commute trip origins

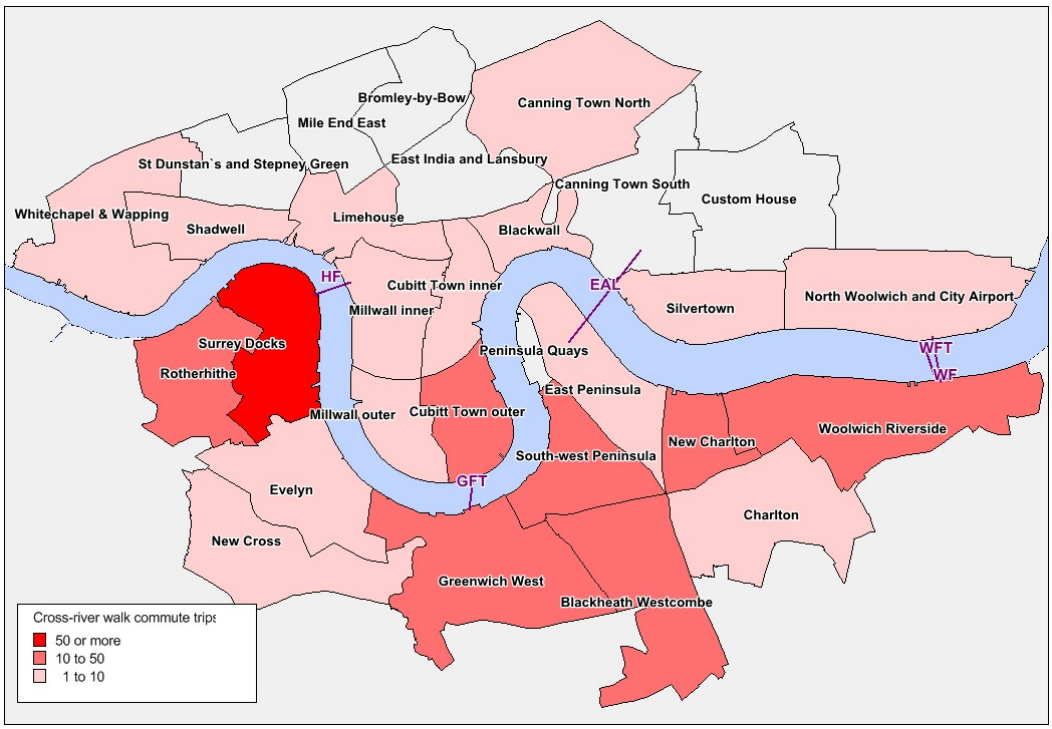
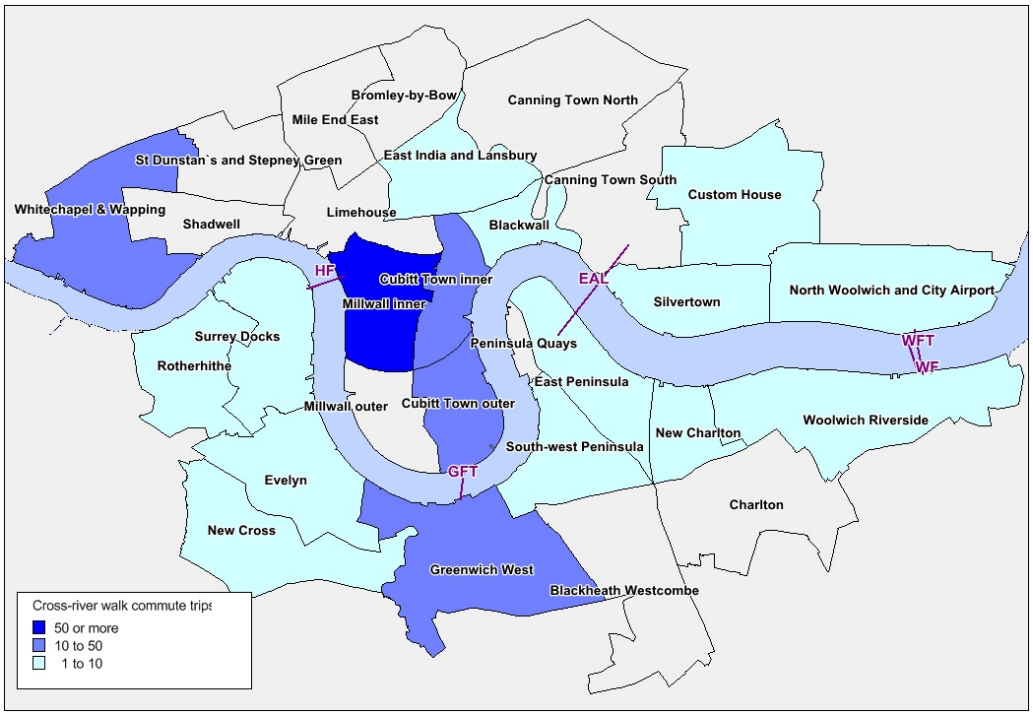


Figure 2-2 Cross-river walk commute trip destinations

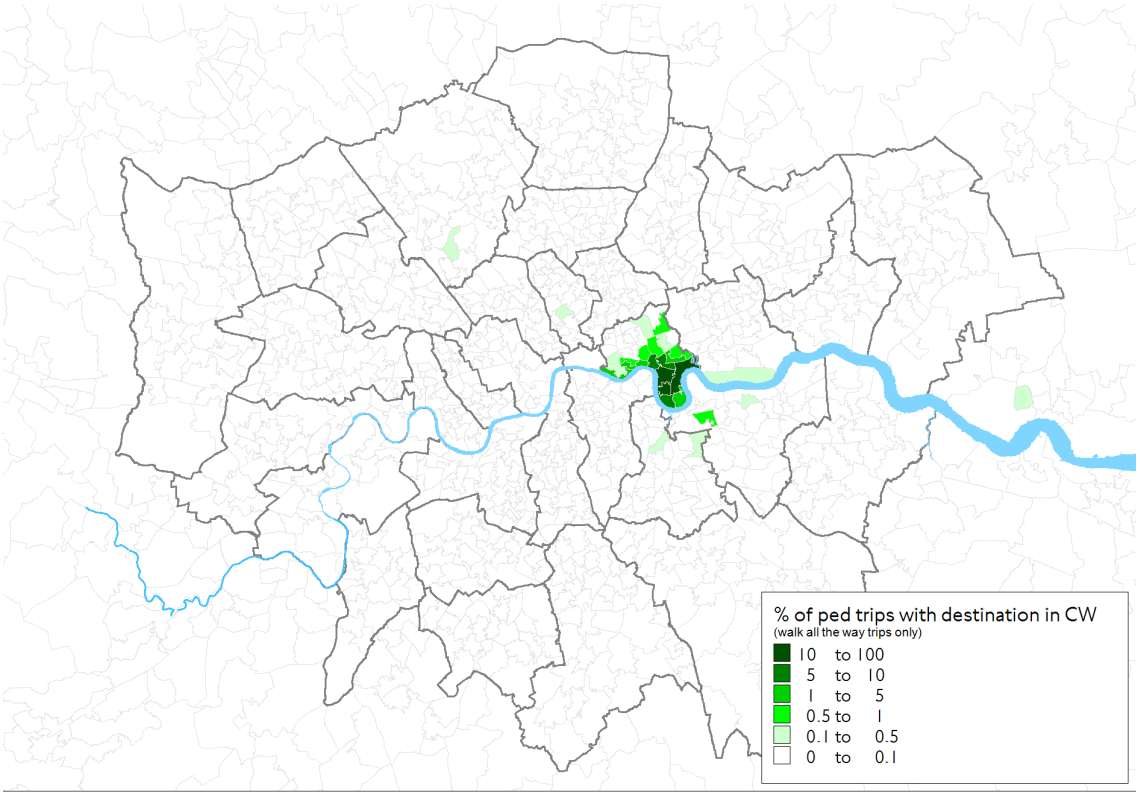


2.6. Surrey Docks has the highest number of cross-river walk commute trip origins (72) and Millwall Inner has the highest number of cross-river walk commute trip destinations (144). The highest demand origin-destination pair is Surrey Docks to Millwall Inner with 58 walk commute trips.

2.7. The Canary Wharf Travel Survey showed a similar pattern of walking demand as the census in 2011 in terms of mode share and the distribution of walking trips. Figure 2-3 shows the origins of walking trips recorded in the Canary Wharf Travel Survey 2015. Note that the definition of walking in this figure does not include trips using the river bus.

2.8. This survey shows that some pedestrians are willing to walk all the way from Limehouse / Wapping or the south of the Isle of Dogs, which represents a relatively long walking commute by London standards. These are walking trips that avoid travelling in relatively crowded sections of the DLR network and that offer a relatively pleasant walking environment.

Figure 2-3: Canary Wharf Travel Survey Walking Origins



Validation counts – Thames screenline

2.9. TfL has conducted pedestrian counts on a River Thames screenline for many years. Table 2-1 shows a selection of the relevant screenline counts from a single weekday in spring 2015.

Table 2-1: Thames screenline walking counts (April to June 2015)

Crossing	AM peak (0700-1000)			Daily (0700-1900)
	Northbound	Southbound	Total	Total
Rotherhithe Tunnel	2	1	3	10
Greenwich Foot Tunnel	184	88	272	2,171
Woolwich Ferry	45	42	87	749
Woolwich Foot Tunnel	58	54	112	489

2.10. While Rotherhithe Tunnel is technically a pedestrian right of way, there is negligible use due to the hostile environment and the tunnel is therefore not included in the pedestrian demand forecasts.

2.11. Woolwich and Greenwich Foot Tunnels were upgraded between 2010 and 2012, and were subject to occasional closures. Annual trend data from the screenline counts shows 120% growth in pedestrian flows in Greenwich Foot Tunnel between 2011 and 2015, while Woolwich pedestrian flows have not yet recovered to pre-2011 levels.

2.12. The survey frequency has changed several times in recent years, but in 2014/15 the counts were repeated on a single weekday in each quarter. Since the River Crossings Model focuses on commuter movements, the resulting data provides a useful context for understanding daily and seasonal factors (Table 2-2).

Table 2-2: Thames screenline walking annualisation factors

Crossings	AM peak (0700-1000) to weekday (0700-1900)	Spring (Apr - Jun) to annual
Woolwich (Ferry and Foot Tunnel)	6.2	3.43
Greenwich Foot Tunnel	8.0	3.61
Tower Bridge	7.1	3.92
Other central London (road)*	3.8	3.65
Other central London (footbridge)*	6.5	3.67
West London (road)	4.0	3.79
West London (footbridge)	4.0	3.27

*The definition of central London here includes all crossings between London Bridge and Vauxhall Bridge

2.13. Several of the crossings (Greenwich, Tower Bridge and the central London footbridges) are characterised by high leisure use occurring after the morning peak. Conversely, the central London road crossings and the west London crossings are all characterised by a higher proportion of total weekday demand occurring in the morning and evening peaks.

2.14. Seasonal fluctuation appears to be highest for less central crossings (west London footbridges and Woolwich) where demand drops more significantly in the winter months. For the remaining crossings, flows in spring are slightly higher than the annual average, resulting in a spring to annual factor of around 3.7.

Validation counts - Emirates Air Line

2.15. Emirates Air Line patronage data for the financial year 2014/15 is used in the validation counts. The relevant summary patronage figures are shown in Table 2-3.

Table 2-3: Emirates Air Line patronage (2014/15)

Average AM peak (0700 to 1000)	128
Average weekday (0700 to 2100)	3,450
Average Saturday (0700 to 2100)	7,433
Average Sunday (0700 to 2100)	6,269
Annual (2014/2015)	1,613,000

Validation counts - River bus services

2.16. TfL commissioned River Bus Origin Destination Surveys (RBODS) in October 2015 to provide up-to-date data on river bus usage. Each of the river bus routes including the Hilton Ferry was surveyed on two weekdays and one Saturday. The RBODS methodology captures the origin and destination piers of all passengers. Survey cards are handed to all passengers to record the access and egress mode and journey purpose. The response rate on the Hilton ferry ranged from 29% to 46% on the different days, and the completed card results are expanded to the full sample to account for the blank surveys cards.

2.17. On a weekday morning the Hilton Ferry carries commuters living nearby, but it also carries guests and visitors to the hotel who can use the service for free. The commuters will be captured in the census travel to work data and other travel surveys, but the hotel users are not captured and should not be included in the validation counts. The RBODS survey cards included hotel/hostel as a separate origin or destination purpose category, and as a result users travelling to or from the hotel can be separated from other users.

2.18. Table 2-4 summarises the RBODS data extracted for the Hilton Ferry and passengers travelling from Greenland to Canary Wharf on the river bus service.

Table 2-4: River bus patronage (2015 RBODS)

Crossing	**Direction**	**AM peak**		**Weekday**			**Saturday**
		Hotel	**Other**	**Hotel**	**Other**	**Total**	
Hilton Ferry	To CW	159	118	245	217	462	460
	From CW	4	13	259	124	383	270
	Both directions	163	132	504	342	846	730
Greenland – Canary Wharf river bus	To CW	-	82	-	102	102	30
	From CW	-	1	-	70	70	18
	Both directions	-	83	-	177	177	48

2.19. London River Services data shows that the ferry service carried a total of just over 365,000 passengers in 2014/15.

Validation counts summary

2.20. The River Crossings Model is validated against 3-hour AM peak counts at relevant Thames crossings. Table 2-5 summarises the 3-hour pedestrian crossing counts and the equivalent weekday figures for these crossings. The proportion of commuting trips at each crossing has been derived from RBODS 2015 and the recent user surveys.

Table 2-5: Summary of pedestrian validation counts

Crossing	Code	Daily (0700-1900)	AM peak (0700-1000)	AM peak % of commuting trips	Observed AM peak commuting demand (0700-1000)
Hilton Ferry (excluding hotel-related)	HF	342	132	74%	97
Greenland – Canary Wharf river bus	GCW	171	83	86%	71
Greenwich Foot Tunnel	GFT	2,171	272	33%	90
Emirates Air Line	EAL	3,082	128	5%	6
Woolwich Ferry	WF	749	87	44%	38
Woolwich Foot Tunnel	WFT	489	112	52%	58

Annualisation

2.21. Since the river crossing model is only based on the AM peak time period, the findings are very sensitive to the annualisation factors used. Table 2-6 summarises the justification for the annualisation factors used.

Table 2-6: Walking annualisation factors

Crossing	AM peak hour to AM peak 3-hr	AM peak 3-hr to 12-hr weekday	12-hr weekday to 24-hr weekday	24-hour weekday to annual
Hilton Ferry (hotel-related)	• 2.00	1.94	1.54	337
Hilton Ferry (non-hotel-related)	• 2.00	2.14	1.32	337
Greenland river bus	• 2.00	1.79	1.14	277
Greenwich Foot Tunnel	2.06	7.98	-	-
Woolwich Ferry and Foot Tunnel	3.49	6.22	-	-
Tower Bridge	2.12	7.08	-	-
Central London crossings	2.03	4.47	-	-
West London crossings	2.29	3.99	-	-
Rotherhithe to Canary Wharf estimated	**2.00**	**4.00**	**1.08**	**320**

3. Overview of pedestrian demand forecasting methods

3.1. Pedestrian demand for a new or improved crossing has been estimated using several complementary methods. Individually, these forecasting methods are subject to a relatively high degree of uncertainty but confidence can be drawn from the fact that alternative methods produce similar results independently. Furthermore, in contrast to other bridge projects, a significant proportion of forecast pedestrian demand is actually made up of existing ferry users rather than completely new walking trips.

3.2. TfL also commissioned primary research to support the development of pedestrian and cycling demand forecasts for river crossings in east London. Three distinct types of survey were carried out:

- Existing users (survey 1) – Stated Preference surveys to understand the preferences of existing pedestrians and cyclists for different types of river crossing and their attributes;
- Mode shift (survey 2) – Stated Preference and Stated Intention surveys targeted at public transport users known to have made cross-river trips between Rotherhithe and Canary Wharf to understand their propensity to shit mode; and
- Induced demand (survey 3) – Stated Intention surveys with a random sample recruited locally to understand the potential for new pedestrian trips to be made that are not currently made.

3.3. Due to the timescales involved the final analysis of these surveys is ongoing at the time of preparing this note. However, the consultant team produced an interim draft set of results prior to undertaking segmentation, weighting and sensitivity tests. The final parameters from these surveys may therefore differ from the interim findings.

Strategic model (LTS/Railplan)

3.4. The first estimate of pedestrian demand is calculated using TfL's suite of strategic transport models:

- The London Transportation Studies model (LTS) is a multi-modal strategic transport model of personal travel in London and the surrounding area. It forecasts how personal travel in London might respond to changes in population and employment, new transport infrastructure, policy interventions, macroeconomic factors and other influences such as levels of car ownership.
- Railplan is a public transport model that forecasts the choice of route taken by bus, rail and Underground passengers. It can measure, analyse and predict the results of changes to London's public transport system.

3.5. A scenario with a new river crossing link in this location was modelled as part of a scenario test for the Isle of Dogs OAPF, and the resulting flows have been factored based on population and employment projections to be compatible with the analysis.

3.6. Care must be taken when deriving forecasts of demand on individual links from the above strategic models. Yet for such a major intervention, these strategic models do

represent the best tool for understanding the demand impacts of a new strategic walk link in the transport network.

Local model of existing pedestrian movements

3.7. A local model of pedestrian commute to work patterns around the Isle of Dogs has also been used. The estimate of pedestrian commuters using individual crossings is calculated in a localised gravity model where demand for river crossings is derived from the availability of crossings, the walking journey time and the availability of alternative public transport crossings.

3.8. Demand associated with Hilton Doubletree hotel guests and staff is captured separately and all users are expected to transfer from the ferry to the new bridge. Other non-commuter demand is assumed to change proportionally to commuter demand.

3.9. The parameters used to calculate the generalised cost of different pedestrian crossing options are derived from survey 1 with existing users.

Mode shift from the Jubilee line and induced demand

3.10. The strategic and local models both estimate substantial new demand for the Rotherhithe crossing, which includes both mode shift from the Jubilee line and induced demand (users making new or more frequent trips). Several data sources show a consistent picture of the potential breakdown of new trips.

3.11. Analysis of the Canary Wharf Travel Survey and registered Oyster card data show a similar pattern in the distribution of people commuting one stop on the Jubilee line into Canary Wharf. Survey 2 was targeted at these people and indicated that up to a walking distance of around 1km from the proposed bridge over 80% would switch (compared to over 60% for a free ferry). Furthermore, survey 3 with local residents selected randomly indicate that for each additional mode shift trip just over one additional induced trip can be expected (mainly leisure trips).

Production of combined forecasts

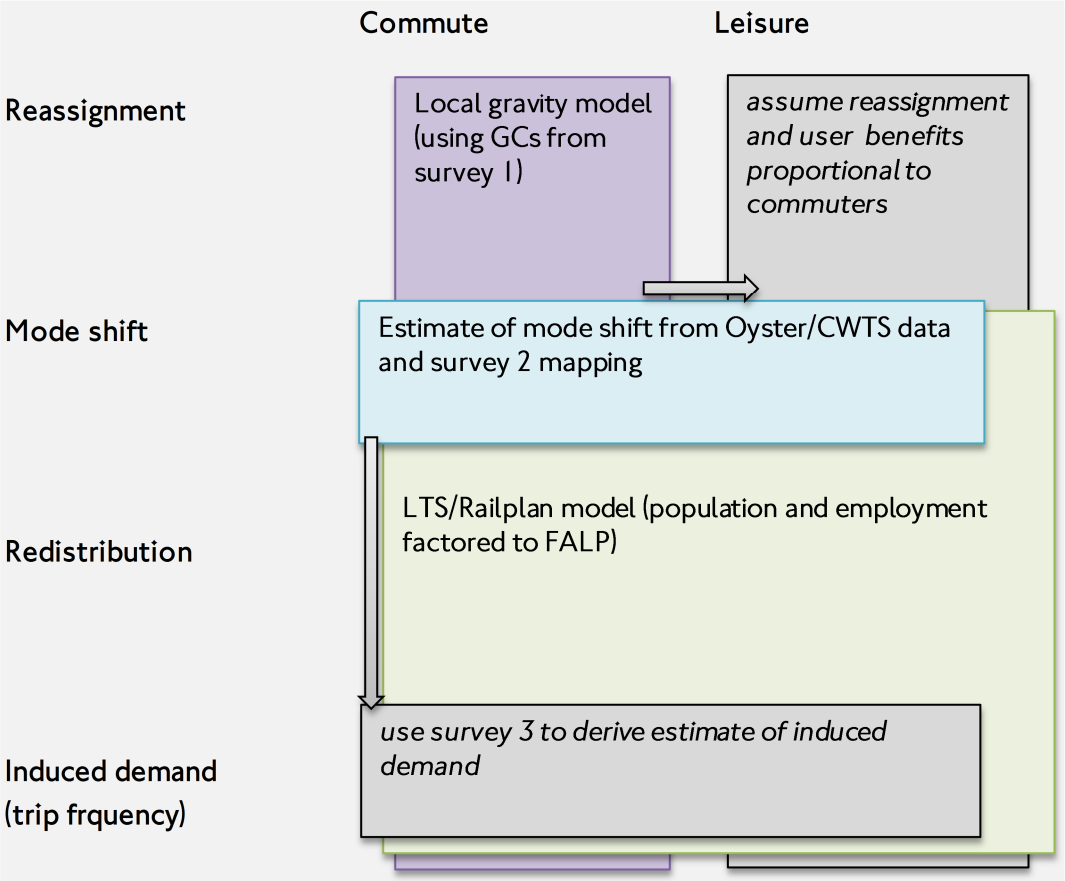
3.12. Figure 3-1 shows theoretical representation of the demand estimates from the different methods described above and the overlap between them. In practice the final estimates are derived in the following manner:

- Hotel-related demand (not shown in the figure) is extracted and assumed to remain stable.
- Commuter reassignment effects are derived from the local gravity model, and the other journey purposes are assumed to be proportional to the change in commuter demand
- The total new demand (mode shift, redistribution and induced demand) as estimated by the local gravity model and the estimate from LTS/Railplan was very

similar, with the latter around 20% higher. A combined estimate therefore adopted as the arithmetic mean of the two methods.

- For appraisal purposes, the total new demand estimate is split into mode shift and redistribution/induced demand. Within the total new demand estimate, the split of mode shift and induced demand is assumed to be in line with a ratio of 1:24:1 derived from survey 3. The proportion of commuters to other journey purposes is assumed to be comparable to the baseline demand (69% commute).

Figure 3-1: Theoretical representation of the combination of forecasts



4. LTS/Railplan

4.1. A scenario with a new river crossing link in this location was modelled as part of a scenario test for the Isle of Dogs OAPF.

4.2. A fixed link crossing was coded into the Railplan walking network at the location of the proposed crossing. The link was coded as a 600m walk link to reflect 550m crow-fly distance between the nodes on the existing network and 50m to reflect the level changes required. The crossing was modelled in a cumulative scenario with a number of other schemes While the other walking network changes are relatively far from the crossing, it is possible that the impacts are slightly over-estimated if they are not entirely independent of each other. On the other hand, the accompanying public transport schemes may reduce the 'push' factor of crowding and therefore could slightly under-estimate demand for the crossing.

4.3. The crossing is included in a 2031 demand model run with a different set of underlying population and employment growth assumptions from the remaining estimates that are based on FALP in 2021. Therefore the predicted flows have been factored based on population and employment projections to be compatible with the remaining forecasts. The northbound flow is factored by the difference in Canary Wharf employment and the southbound flow by the difference in Canary Wharf population.

4.4. When factored back to a comparable 2021 estimate, the new demand for fixed crossing at this location is forecast at 815 trips in the morning peak. This estimate does not account for potential impedance factors associated with the need to open for tall vessels, and therefore the same range of penalty is applied proportionally to this estimate as to the localised gravity model.

5. River Crossings Model methodology and assumptions

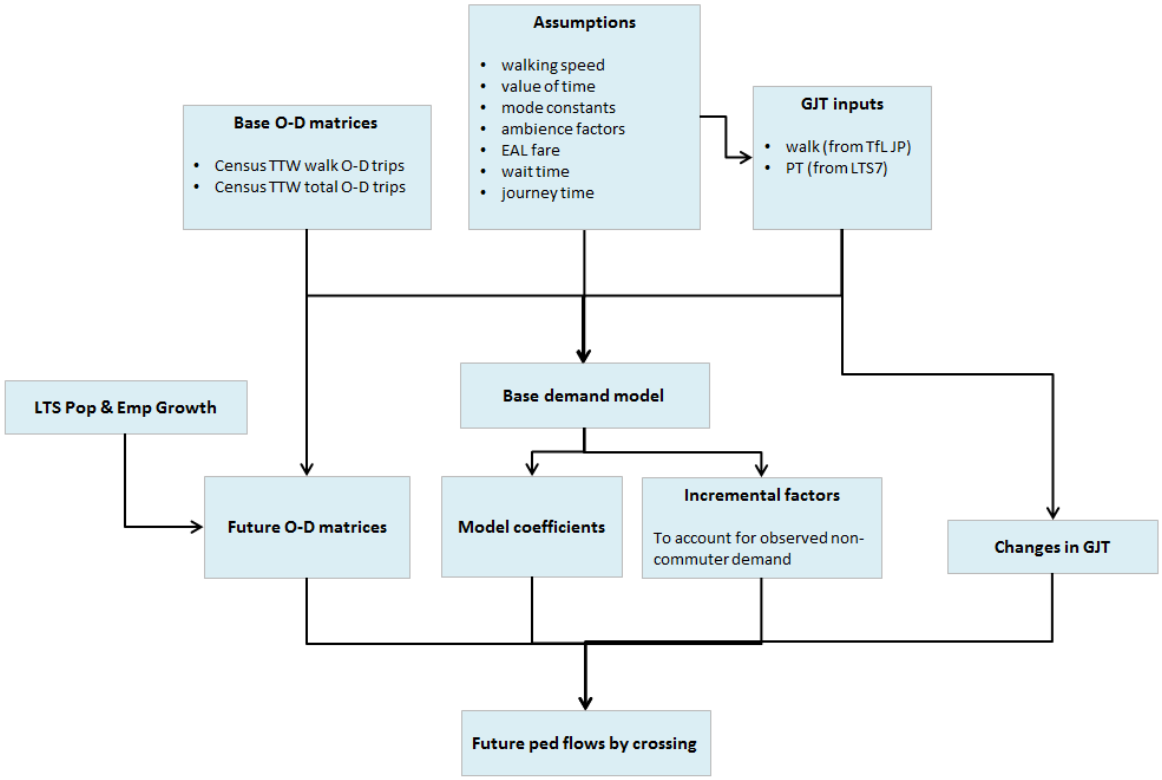
AM peak model structures

5.1. The River Crossings Model (RCM) is based on a bespoke spreadsheet model developed in 2010 and updated in 2015 to forecast future demand for the Silvertown Tunnel, which has been adapted and re-based to 2015 for the purpose of this study.

5.2. The RCM model is limited to a morning peak (0700-1000) model for walking. It is based on a journey to work model containing commuting origin-destination matrices for the area surrounding Canary Wharf and the Royal Docks, and forecasts the relative changes in mode share for walking as a result of changes in generalised journey time.

5.3. The walking model is a localised gravity model where demand for river crossings is derived from the availability of crossings, the walking journey time and the availability of alternative public transport crossings. The method is summarised in Figure 5-1.

Figure 5-1 AM Peak core walk demand forecasting method



5.4. The model was updated to a 2015 base year, using recent data including estimates of Hilton ferry patronage from the 2015 RBODS survey.

Walking OD matrices

5.5. Matrices of existing commuting travel patterns are taken from the Census 2011 Travel to Work (TTW) data.

5.6. Future year OD matrices have been created for 2021 using population and employment growth factors from the Further Alterations to the London Plan (FALP).

Future population and employment

5.7. Population and employment projections have been extracted from the latest London Transportation Studies (LTS) model, known as LTS 7. These were used to grow the 2015 baseline OD matrices to the future year scenarios.

Generalised journey time parameters

5.8. The generalised journey time (GJT) takes into account actual journey time, associated fare, additional waiting and walking time and penalties associated with a trip on each crossing, as derived from survey 1. Walk GJT is formulated in a similar way to TAG guidance for public transport GJT, based on clock time and a number of assumptions.

5.9. Public transport generalised journey times for base and future years were extracted from LTS.

5.10. Cross-river walk generalised journey times are composed of the actual shortest path journey times between the model zone centroids and the respective crossing, and the time taken to cross the river inclusive of any weighting or penalty factors applied. TfL Journey Planner was used to estimate base walk times between the model zone centroids and the access points for each crossing.

5.11. The average assumed walking speed is 1.5m/s, which is higher than the BCDM value of 1.33m/s but is closer to actual observed walking speeds at peak time.

5.12. A Value of Time of £7.95 per hour has been used to convert monetary costs such as the ferry fare into GJTs, based on the London Underground Value of time in 2015 prices taken from the TAG data book Autumn 2015 edition.

5.13. Weightings and penalties are applied to represent the disincentive effect of certain aspects of using the crossings.

- Mode constant is a flat penalty applied to each stage of the overall journey and covers aspects such as perceived reliability of that mode of transport. Note that the LTS model uses boarding penalties from Railplan for the public transport modes (for London Underground (LU) this is 3.5 minutes and for buses 8.5 minutes). Survey 1 indicates that pedestrians would favour a new ferry by 13.6 minutes and a new tunnel by a factor 3.5 minutes relative to a new bridge.
- Time penalty multipliers simulate the costs of any other additional time associated with the crossing, other than the crossing time itself. These include the wait time and additional walk time as part of a PT trip. The pedestrian wait time multiplier obtained from survey 1 is very close to the Railplan standard value of 2.5 times clock time and therefore the 2.5x weighting is used.
- The penalty applied to bridge is made of two independent linear relationships for the frequency and duration and bridge openings derived from the results of survey 1. These are 0.2 minutes' penalty for each minute of opening duration and 0.11 minutes' penalty for each time the bridge needs to open per 18-hour day. There remains some uncertainty about the these coefficients and further work is being conducted to understand whether these penalties are linear or if there is a

threshold effect in users' acceptance of the openings. In the meantime this linear penalty is being treated as a high opening penalty to create a forecasting range.

- Pedestrians also place a weight on having segregated space where they are not sharing with cyclists. All of the fixed link crossings are assumed to have segregated lanes.

Approach to calibration and validation (2015)

5.14. The calibration of walk demand to the observed commuting patterns in the study area is challenging. As confirmed by the Canary Wharf Travel Survey (CWTS), there are certain areas around the Isle of Dogs with concentrations of commuters walking to work on the Isle of Dogs (e.g. from Wapping/Limehouse or existing users of the Hilton Ferry). However, outside of these concentrations the travel to work dataset contains low numbers of cross-river commute trips on foot, leading to a sparse demand matrix with high variability.

5.15. Contrary to cycling where the majority of AM peak demand is commuting, a much smaller proportion of AM peak walking demand relates to the journey to work (around one third in the core study area). The travel to work dataset for model calibration consists of travel to work data with no time period specified, but the CWTS suggests that 93% of commute trips occur in the morning peak (07:00 – 10:00). Screenline data for the river Thames is available for validation, with estimates of the proportion of commuting trips (see Table 2-5) in the morning peak. The walking gravity model seeks to establish a statistical relationship between the cross-river walking generalised journey time and the observed walking commuting trips between cross-river origin-destination zones.

5.16. Given the level of variation observed in the 2015 base model, the modelled walking commuter demand is applied incrementally in 2021. Thus the 2021 model forecasts of AM commuter demand are based on the reference case walk mode shares plus the change in walk mode share between each scenario and the reference case.

5.17. Note that OD pairs that are greater than 4km crow-fly distance apart are excluded, as are OD pairs where the ratio of the actual walk distance to the crow-fly walk distance exceeds 3.

Calibration of cross-river walk commuting

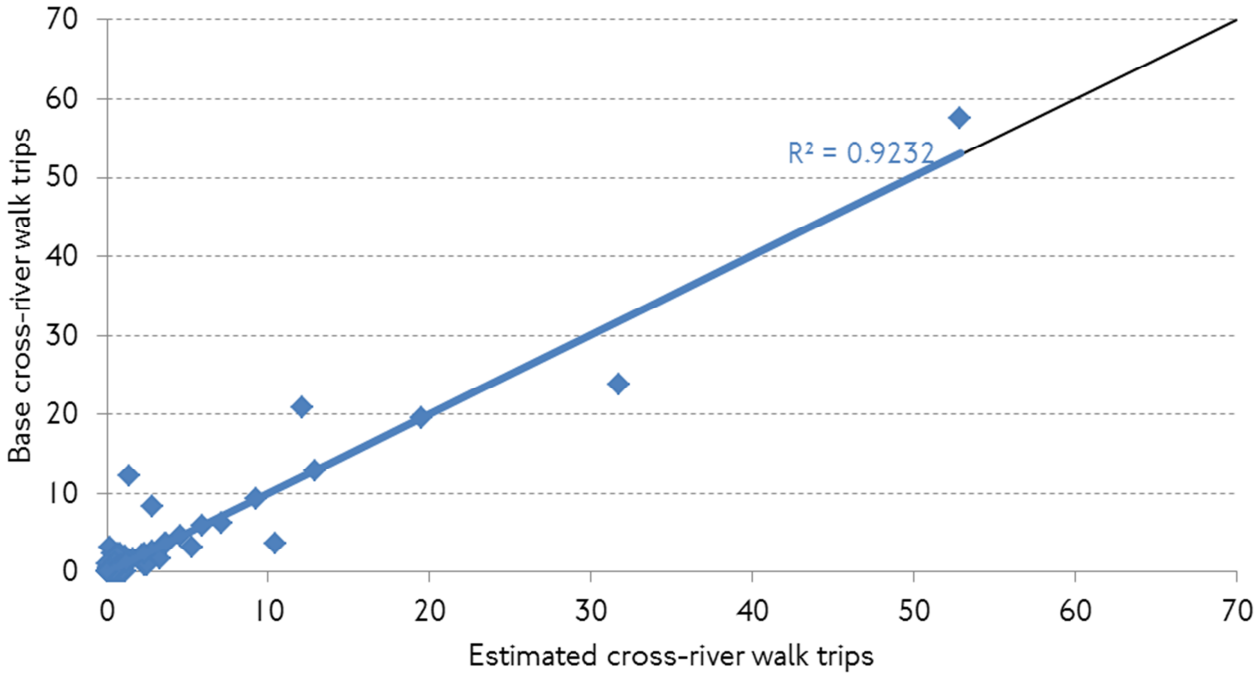
5.18. It is possible to establish a statistical relationship observed and modelled cross-river walk mode shares. The resulting coefficients are shown in Table 5-1.

Table 5-1: Walk model coefficients

Constant	0
Factor applied to crow-fly distance	-0.01002
Factor applied to ration of public transport GJT / walk GJT	0.10147

5.19. Figure 5-2 shows the level of correlation between estimated 2015 base and modelled demand between origin and destination zones. While the overall relationship appears reasonable, the statistical fit for individual zone OD pairs is characterised by considerable residual errors. For this reason, it is appropriate that the model is applied in an incremental manner.

Figure 5-2: Calibration of commuter cross-river walk trips (2015 base)



Generalised journey time parameters

5.20. The following parameters apply to all of the river crossing GJTs:

- Average walk speed of 1.5 metres per second
- Factor of 1 applied to time spent walking
- Factor of 2.5 applied to average waiting time
- Monetary costs converted to time using a £7.95 value of commuting time (2015 prices)

5.21. Table 5-2 shows the additional GJT factors and penalties applied in the base validation of the walk assignment. These factors are derived from the initial findings of survey 1.

Table 5-2: Additional GJT factors and penalties in base walk validation

	Existing ferry	Existing foot tunnel
Mode constant (minutes)	-7.3	6.3
Pedestrian-cyclist segregation: penalty for non-separated links (minutes)	0	10.8

Validation against Thames crossings screenline

5.22. Table 5-3 shows the observed flows on the Thames crossings screenline and the modelled commuter flows assigned to each of these crossings.

Table 5-3: Summary of Thames crossing screenline flows (AM peak, 2015)

Crossing	Observed AM peak (0700-1000) commuting demand	Modelled (calibrated against travel to work commute ODs)	Difference
Hilton Ferry (excluding hotel-related)	97	70	-27
Greenland – Canary Wharf river bus	71	27	-44
Greenwich Foot Tunnel	90	116	26
Emirates Air Line	6	10	3
Woolwich Ferry	38	21	-75
Woolwich Foot Tunnel	58		
Total	**361**	**244**	**-117**

6. Mode shift from the Jubilee line and induced demand

Current patterns of commuting between Rotherhithe and Canary Wharf

6.1. Analysis of the Canary Wharf Travel Survey and registered Oyster card data show a similar pattern in the volume and distribution of people commuting one stop on the Jubilee line into Canary Wharf.

6.2. Table 6-1 shows the split between river bus and Jubilee line use of commuters living within distance catchments of the existing ferry pier. There is a significant fare premium (and no integration with the Travelcard) associated with the river bus, so even within the 5-minute walking catchment of the ferry pier its mode exceeds 50% but a significant minority of users still travel a considerable detour via Canada Water.

Table 6-1: Mode share of Rotherhithe to Canary Wharf commuters

Distance from existing Hilton ferry pier	% River bus	% Jubilee line	% other	Estimated number of Jubilee line users
<400m	56%	38%	6%	60
400-800m	45%	52%	3%	150
800-1,200	20%	78%	2%	391
1,200-1,600	26%	68%	6%	230

Potential for mode shift from Jubilee line users

6.3. Survey 2 was targeted at people known from Oyster data to have made one-stop Jubilee line trips between Canada Water and Canary Wharf. These users were asked whether they would walk or cycle instead of using the Jubilee line. The stated intention responses indicate a high willingness to walk to the bridge rather than to the Jubilee line for commuters living up to 15 minutes' walk away. The willingness to switch to a free ferry is lower.

Table 6-2: Users stated intention to shift from the Jubilee line to a new crossing

Distance from existing Hilton ferry pier	Estimated number of Jubilee line users	Navigable Bridge		Enhanced ferry (free)	
		% mode shift	Mode shift trips	Free ferry % mode shift	Free ferry daily commuters
<400m	60	100%	60	88%	53
400-800m	150	80%	120	64%	97
800-1,200	391	85%	332	74%	289
1,200-1,600	230	68%	156	51%	118

6.4. The results indicate that the number of Jubilee line users expected to shift to the navigable bridge would be 669 daily, and to the free ferry 556. These daily estimates of mode shift users are factored down to AM peak estimates using a factor of 3.59 derived from observed RODS data between the two stations.

6.5. It should be noted that this estimate of mode shift demand is calculated using commuting trip numbers and a stated intention to switch to the new crossing based on TfL passengers travelling with a range of journey purposes. As such the total volume of mode shift demand may be under-estimated.

Potential for induced demand

6.6. Survey 3 was conducted with local residents selected randomly and was designed to understand the potential for residents to make additional trips that they do not currently make. The questionnaire included a mode shift question as well to disaggregate between mode shift and induced demand.

6.7. The stated frequency with which respondents would switch their mode for existing trips or make new trips altogether has been cross-tabulated. This indicates that for each additional mode shift trip an additional 1.24 induced trips can be expected. The stated journey purposes (multiple choice) for induced trips are predominantly non-work-related (shopping, leisure, visiting friend and relatives).

7. Summary of pedestrian demand forecasts

7.1. This section outlines the nature of the potential crossings and the findings of the options tested.

Options

7.2. Four options were tested for this analysis to feed into the Strategic Outline Business Case and Option assessment Reports for a new crossing:

- Navigable Bridge – This would be a bridge located near to the existing ferry that would allow vessel to pass. In light of the uncertainty about the impact of openings on the attractiveness of the bridge to pedestrians, demand is expressed as a range.
- Immersed Tunnel – This would be a new tunnel located near to the existing ferry that would be available for pedestrians to use 24/7.
- Enhanced ferry (free) – This would be a new ferry operating at a high frequency (5-minute headway) and free of charge to pedestrians.
- Enhanced ferry (TfL fare) – This would be a new ferry operating at a high frequency (5-minute headway) with prices integrated into the TfL standard fare system (£1.45 single fare in 2014 prices).

7.3. For the purpose of appraisal, access to the fixed link crossings or the ferry is assumed to provide a combination stairs, lifts and ramps. Under all options, it is assumed that the existing ferry would cease operation.

Estimates of morning peak (0700-1000) demand

7.4. Table 7-1 shows the alternative estimate of AM peak 3-hour demand for a fixed link crossing at this location derived from LTS/Railplan compared to the local gravity model RCM. The LTS/Railplan estimate of the fixed link crossing has been factored down proportionally for the remaining crossing options. The mean average of the two estimates is used as the central pedestrian demand forecast.

Table 7-1: Alternative estimates of AM peak 3-hour pedestrian demand

	Strategic model (LTS/Railplan)	Local model (RCM)	Mean average
Navigable Bridge (no opening penalty) or Immersed Tunnel	815	698	756
Navigable Bridge (high opening penalty)	696	596	646
Enhanced ferry (free)	506	433	469
Enhanced ferry (TfL fare)	369	316	343

7.5. The above estimates exclude existing hotel-related demand for the ferry, which is not included in Railplan and is treated separately in RCM.

7.6. The method for calculating mode shift and induced demand described in section 6 produces an estimate of 186 mode shift trips in the morning peak. Based on the 1.24 multiplier, an additional 231 induced demand trips are estimated for the fixed link crossing in the morning. This total estimate of 417 trips is very close to the estimate from the local gravity model, which equates to 398 new pedestrian trips when existing pedestrian reassignment is excluded. This provides further reassurance that the overall forecast of demand is in the correct ballpark and that the breakdown of demand by category is sensible.

Navigable Bridge (no opening penalty) or Immersed Tunnel

7.7. Table 7-2 shows the breakdown of forecast morning peak demand for the bridge or tunnel (with no opening penalty) by demand category and journey purpose, calculated using the rules set out paragraph 3.12.

Table 7-2: Morning peak 3-hour pedestrian demand (bridge or tunnel with no opening penalty)

Category of demand	Commuter	Other journey purpose	Total
Existing pedestrians	206	93	300
Mode shift	140	64	204
New pedestrians	174	79	253
Total (excluding hotel-related demand)			**756**
Existing hotel-related demand (assumed to remain unchanged)			163
Total			**919**

Navigable Bridge (high opening penalty)

7.8. Table 7-3 shows the breakdown of forecast morning peak demand for the bridge or tunnel (with a high opening penalty) by demand category and journey purpose.

Table 7-3: Morning peak 3-hour pedestrian demand (bridge with high opening penalty)

Category of demand	Commuter	Other journey purpose	Total
Existing pedestrians	196	89	285
Mode shift	111	50	161
New pedestrians	138	62	200
Total (excluding hotel-related demand)			**646**
Existing hotel-related demand (assumed to remain unchanged)			163
Total			**809**

Enhanced Ferry (free)

7.9. Table 7-4 shows the breakdown of forecast morning peak demand for a free ferry by demand category and journey purpose.

Table 7-4: Morning peak 3-hour pedestrian demand (free ferry)

Category of demand	Commuter	Other journey purpose	Total
Existing pedestrians	169	77	246
Mode shift	69	31	100
New pedestrians	85	39	124
Total (excluding hotel-related demand)			**469**
Existing hotel-related demand (assumed to remain unchanged)			163
Total			**632**

Enhanced Ferry (TfL fare)

7.10. Table 7-5 shows the breakdown of forecast morning peak demand for the bridge or tunnel (with a high opening penalty) by demand category and journey purpose.

Table 7-5: Morning peak 3-hour pedestrian demand (TfL fare ferry)

Category of demand	Commuter	Other journey purpose	Total
Existing pedestrians	166	75	241
Mode shift	31	14	45
New pedestrians	39	18	56
Total (excluding hotel-related demand)			**343**
Existing hotel-related demand (assumed to remain unchanged)			163
Total			**506**

Annualisation and growth

7.11. The morning peak 3-hour demand forecasts are annualised using the following factors:

- Hotel-related demand is assumed to retain its current daily and annual profile.
- Estimates of mode shift demand are factored to a full day using the RODS profile of Jubilee line demand between Canada Water and Canary Wharf.
- Otherwise the Rotherhithe to Canary Wharf factors derived as shown in Table 2-6 are used.

7.12. Due to the highly peaked nature of pedestrian demand for the crossing, the 2021 estimates of pedestrian demand are factored up to future years based on an index of forecast employment growth Canary Wharf (2031 = 1.45, 2041 = 1.91).

7.13. Table 7-6 shows a summary of morning peak, daily and annual (rounded) demand for the options.

Table 7-6: Summary of pedestrian demand in 2021, 2031 and 2041

Year	Time period	Navigable bridge	Immersed Tunnel	Enhanced ferry (free)	Enhanced ferry (TfL fare)
2021	Morning peak (3-hr)	809 - 919	919	632	506
	Daily (24-hr)	3,200 – 3,600	3,600	2,500	2,000
	Annual	1m – 1.2m	1.2m	0.8m	0.6m
7.14. 2031	Morning peak (3-hr)	1,100 – 1,300	1,300	800	700
	Daily (24-hr)	4,400 – 5,000	5,000	3,300	2,600
	Annual	1.4m – 1.6m	1.6m	1.1m	0.8m
7.15. 2041	Morning peak (3-hr)	1,400 – 1,600	1,600	1,100	800
	Daily (24-hr)	5,600 – 6,500	6,500	4,200	3,300
	Annual	1.8m - 2.1m	2.1m	1.4m	1.1m