The Impact of Crossrail on Visitor Numbers in Central London

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Important notice

Our work for this assignment commenced in July 2013 and was completed in December 2013. Our primary sources of information have been information provided to us by Crossrail, Ltd and Transport for London. We have not sought to establish the reliability of the sources by reference to other evidence, unless otherwise stated. We have supplemented data where relevant through documents provided by the New West End Company and inmidtown, our own industry knowledge, and from our own limited independent research.

The projections and conclusions set out within this report are dependent upon the validity of the assumptions and data upon which they are based. Actual demand for Crossrail and for Central London stations is likely to be different from the projections shown, because events and circumstances frequently do not occur as expected. The difference between actual demand and our projections may be material. The results shown herein are for indicative informational purposes only and are not intended to inform investment decisions, whether directly or indirectly related to Crossrail and/or London Underground. We accept no responsibility for realisation of projected demand or associated prospective financial results.

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Ove Arup & Partners Limited
January 2014

The Impact of Crossrail on Visitor Numbers in Central London

Final report

Prepared on behalf of the New West End Company, inmidtown, the Fitzrovia Partnership and Transport for London, working with Crossrail Ltd, Camden Council and the City of Westminster.

January 2014

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Executive Summary

Acknowledgements

Arup is very grateful for the assistance provided by Crossrail and TfL for their advice and assistance in obtaining access to reports and data. We thank GVA, the planning and property consultancy, for discussing its report on future retail opportunities in the St Giles area and CBRE, the commercial real estate services firm, for providing its report on retailing in the West End. We very much appreciate the comments and input from all three BIDS as well as the City of Westminster and London Borough of Camden.

Background

The New West End Company, inmidtown, the Fitzrovia Partnership and Transport for London (TfL) commissioned Arup to undertake a review of Crossrail-related pedestrian and public transport demand projections for Bond Street, Tottenham Court Road and Farringdon station street-level areas. This executive summary describes our approach and primary findings and offers some conclusions and recommendations.

A primary focus of this study was to assist stakeholders to understand better the likely impacts and opportunities for the areas of central London within their Business Improvement Districts (BIDs) as a result of future visitor demand from Crossrail.

Introduction

London's population is growing. The latest GLA London Plan indicates that the population encompassed by the GLA boundary will reach some ten million by 2030. This rate of growth equates to nearly two thousand people every eight days. This is unprecedented in the city's modern history.

It is also a rate of growth that is significantly higher than that adopted for Crossrail's Hybrid Bill in 2004. Whilst Crossrail has been designed with long term capacity in mind, as this study shows, the rate at which that capacity is utilised is anticipated to be faster than was originally envisaged. This earlier than anticipated demand may well bring pressures and opportunities to those parts of London and elsewhere served by Crossrail's new stations.

Standard industry practice is for station and rolling stock designs to be modelled on the weekday commuter peak. For many stakeholders, such as retailers, the entertainment industry, food and beverage providers and local authorities, there is very considerable interest in understanding volume and profile of visitor numbers at other times of the day. It is evident that further opportunities for research and analysis remain.

In undertaking our analysis, we have sought to build on previous visitor projections made by Crossrail. Using several scenarios of potential growth based on different population projections, we have incorporated a more 'granular' assessment of the stations' local areas, considering factors of particular interest to businesses operating in Central London.

As with all work of this nature, our projections need to be treated with caution. Rarely do forecasts materialise as envisaged. They are perhaps most useful at indicating a broad direction of travel. We discuss the limitations of our analysis below.

Executive Summary

Approach

Our approach to modelling visitor numbers has combined analysis of demographic drivers with more detailed consideration of the local areas surrounding the three Central London Crossrail stations in question.

The analysis takes as a starting point the base data provided in the Crossrail Bill Environmental Statement, Volume 8 and other studies. We provide indicative projections of future demand based upon a series of assumptions and factored relationships, which carry an intrinsic level of uncertainty. Analyses pivot off the base data to provide the following indicators:

- The impact of faster London Plan growth (delivering Crossrail demand growth earlier);
- Average daily and annual demand;
- Weekday off peak hour demand;
- Saturday and Sunday busy hour demand;
- Seasonal peak demand (summer and winter);
- Segmentation of trips by user profile based on trip purpose;
- Distribution of trips to areas around each station based on destination.

Our projections represent *all* station entries and exits, rather than only those related specifically to Crossrail, and therefore include both Crossrail and London Underground station demand. For example, our projections for Tottenham Court Road include entries and exits for passengers using the Central and Northern lines. A full methodology can be found in Appendix A.

Limitations

We note that our approach provides only an indicative projection of future demand based upon a series of assumptions and factored relationships. These projections carry an intrinsic level of uncertainty. The resulting analysis only can provide an indication of the level of demand and impact that may occur in 2026.

We have made a number of simplifying assumptions in order to complete our work. These assumptions have been necessary in order to build upon previous work completed by Crossrail Ltd. In extending projections to off-peak periods, modelling seasonality, and projecting demand beyond 2016, to 2026, only limited comparability exists between our projections and Crossrail's previous forecasts.

Because we have derived our projections from Crossrail Ltd station counts and uplifted according primarily to population growth estimates, our projections may not wholly account for increases due to other factors, such as tourism for example. Indicative projections based upon Crossrail's demand forecasts essentially represent 'unconstrained' demand.

With Crossrail's opening, demand for London's wider public transport network will inevitably be influenced by the new line. We have not considered the potential redistribution of demand amongst other Central London (Tube) stations that could occur with significant growth. Similarly, our approach does not account for the effects on the surrounding network or on other Underground stations, such as Marble Arch, Holborn or Oxford Circus.

Executive Summary

Limitations *(continued)*

Inevitably for a study of this scale and timing, there have been considerable limitations to our ability to model walking routes from stations and to project the distribution of onward journeys. We have not drawn conclusions about the future profile of station users or their journey purpose. There may be opportunities to understand potential future users based on emerging TfL analysis.

Finally, as with any modelling of unconstrained demand, a certain amount of "chicken and egg" needs to be borne in mind. Without the offices, residential development, entertainment and retail offer to attract and sustain visitors to Central London the numbers in question may not materialise. How Central London's stakeholders choose to respond to the prospect of many tens of millions more visitors a year is inevitably a question of broader debate. Our analysis suggests that now is an opportune time for that debate to be reinvigorated so that the opportunities and pressures the line will create can be most effectively addressed.

Executive Summary

Findings

Significant growth is projected relative to current station demand and projections based upon the Hybrid Bill (2004) forecast. Figure (i) right, compares present combined demand for Bond Street, Tottenham Court Road and Farringdon stations with different indicative projections of future demand at the three stations. These projections are for Bond Street, Tottenham Court Road and Farringdon stations, including both London Underground and Crossrail demand.

Arup's projections show that Bond Street, Tottenham Court Road and Farringdon stations could together deliver some 250 million people to Central London in the year 2026. This figure represents:

- Some 65 million more passengers in 2026 than the (2004) Crossrail forecasts would have projected; and
- Approximately 165 million additional passengers per year than currently use the stations.

Looked at another way, Arup's analysis indicates that Bond Street, Tottenham Court Road and Farringdon stations will deliver some 745,000 people to Central London per day in the year 2026, representing:

- Some 195,000 more passengers per day in 2026 than the (2004) Crossrail forecasts would have projected; and
- Roughly 510,000 additional passengers per day than currently use the station.

As with our other projections, these findings indicate unconstrained demand for the stations based upon the application of demographic data to Crossrail Ltd's station demand projections.

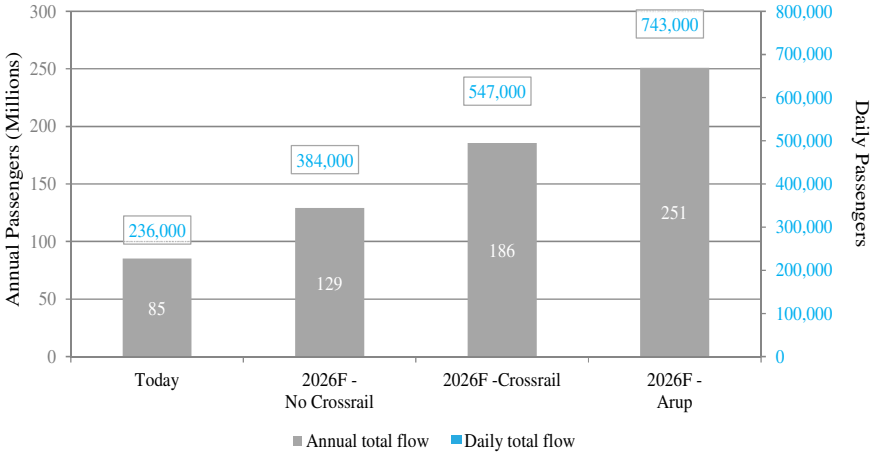

Figure (i): Total *passengers* now and according to Crossrail Ltd and Arup projections. The projections are for annual (grey; shown in millions) and daily (blue) passenger demand. As with similar histograms presented in this report, the second column projects London Underground demand at Bond Street, Tottenham Court Road and Farringdon stations in 2026 without Crossrail's development; the third projects station demand with Crossrail's development, using Crossrail Ltd's approach but updated assumptions; and the fourth column shows indicative station demand in 2026 according to Arup's approach and updated inputs/assumptions.

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Executive Summary

Findings: Bond Street

As shown in figure (ii), projections indicate that Bond Street could reach some 100 million passengers per annum equivalent to some 285,000 passengers per day in 2026. These figures represent an increase of some 200% compared to current totals and 20% compared to a projection based upon Crossrail Ltd's current approach.

As shown in the figures below, Arup projections indicate that demand could increase significantly relative to current gate flows at the station, increasing, on an average day, as much as 200% in the morning peak (using an unconstrained approach to projecting station demand). Each column below represents gate flow (in both directions) on a per hour basis.

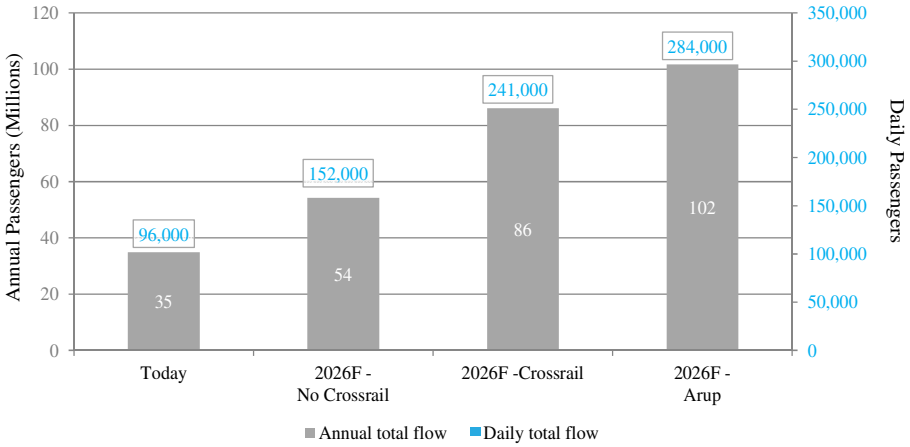

Figure (ii): Bond Street passengers now and according to Crossrail and Arup projections

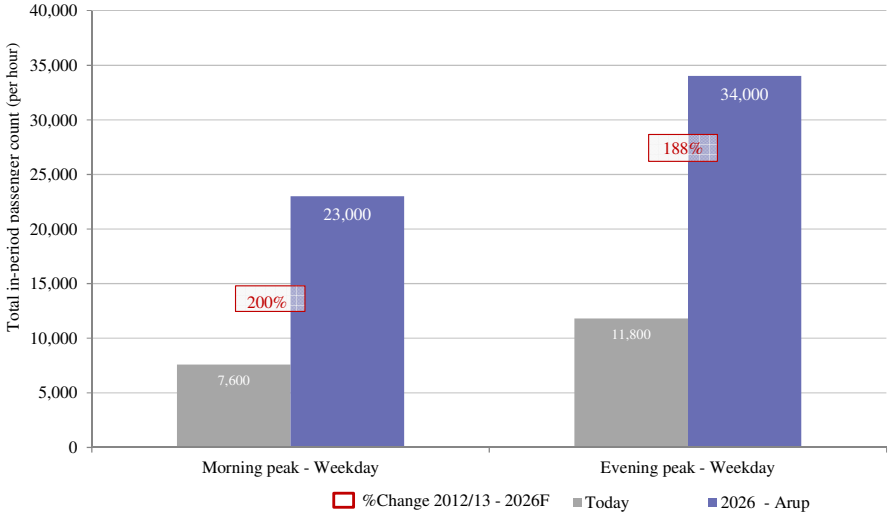

Figure (iii): Average Bond Street entries and exits (peak) now and according to Arup projections

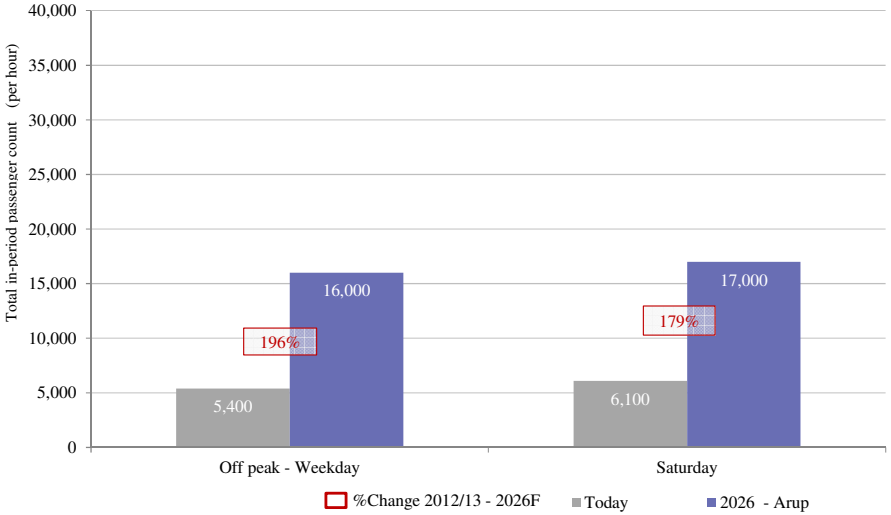

Figure (iv): Average Bond Street entries and exits (off-peak) now and according to Arup projections

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Executive Summary

Bond Street entries and exits

During the average weekday afternoon peak, it is projected that 34,000 passengers per hour will enter and exit Bond Street station via two access points. The majority of visitors (18,000 per hour) are projected to enter/ exit via the western entrance on Davies Street (all Davies Street entries and exits), with the remainder (16,000 per hour) using the eastern entrance on Hanover Square.

During the weekday off peak and weekend periods, it is projected that relative to the peak periods, a higher proportion of trips will be for leisure purposes. As a result, passenger flows will be higher to/from the North, travelling to/from Oxford Street.
During the busiest summer period and in the Saturday off-peak period, it is projected that 22,000 passengers per hour will enter and exit Bond Street station via the two access points. As for the off-peak period (of 'average' months), passenger flows are projected to be highest from Davies Street, leading to Oxford Street.

During the busy pre-Christmas period and in the Saturday off peak period, it is projected that 24,000 passengers per hour will enter and exit Bond Street station via the two access points – with the highest volumes again travelling to and from Oxford Street via Davies Street.

Executive Summary

Findings: Tottenham Court Road

As shown in the figure (v) projections indicate that Tottenham Court Road station could achieve demand of some 110 million passengers per annum equivalent to approximately 300,000 passengers per day in 2026. These figures represent an increase of some 250% compared to current levels and 50% compared to a projection based upon Crossrail Ltd's approach.

As shown in the figures below, Arup projections indicate that demand could increase significantly relative to current gate flows at the station, increasing, on an average day, as much as 250% in the weekday off peak period (using an unconstrained approach to projecting station demand). Each column below represents gate flows for a single hour in the peak or off-peak period specified.

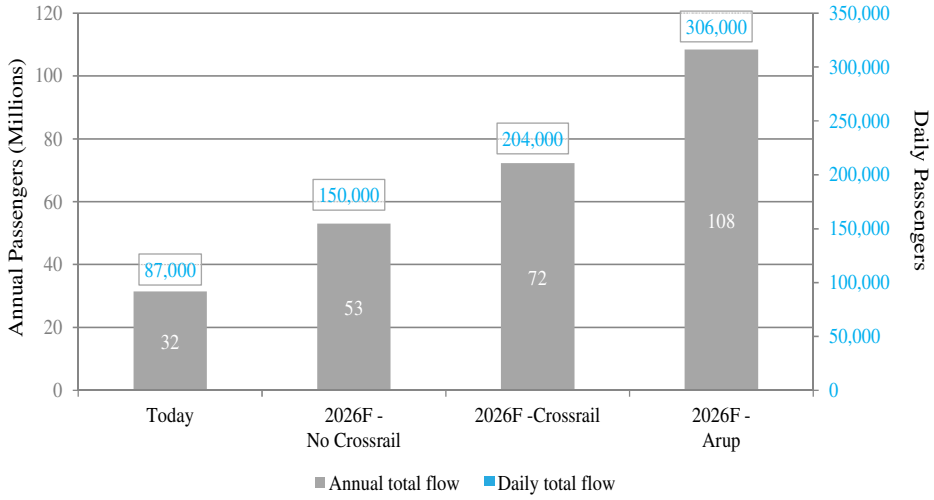

Figure (v): TCR passengers now and according to Crossrail and Arup projections

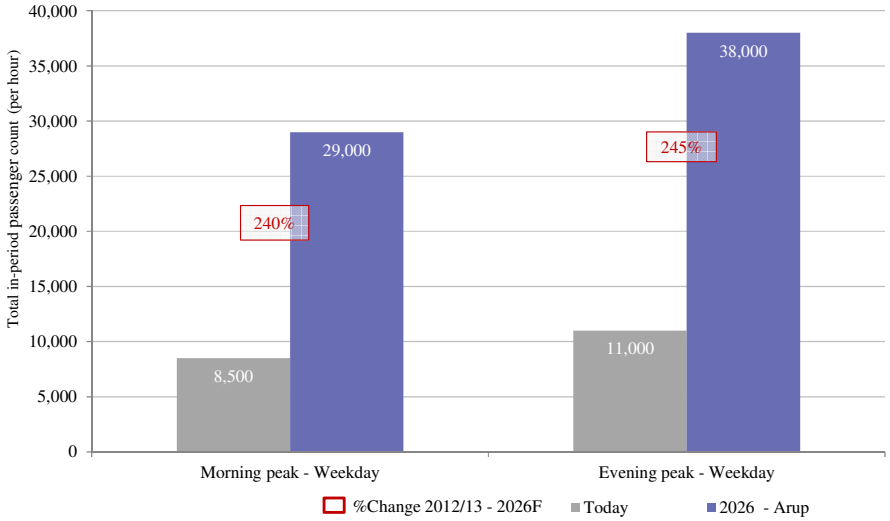

Figure (vi): Average TCR entries and exits (peak) now and according to Arup projections

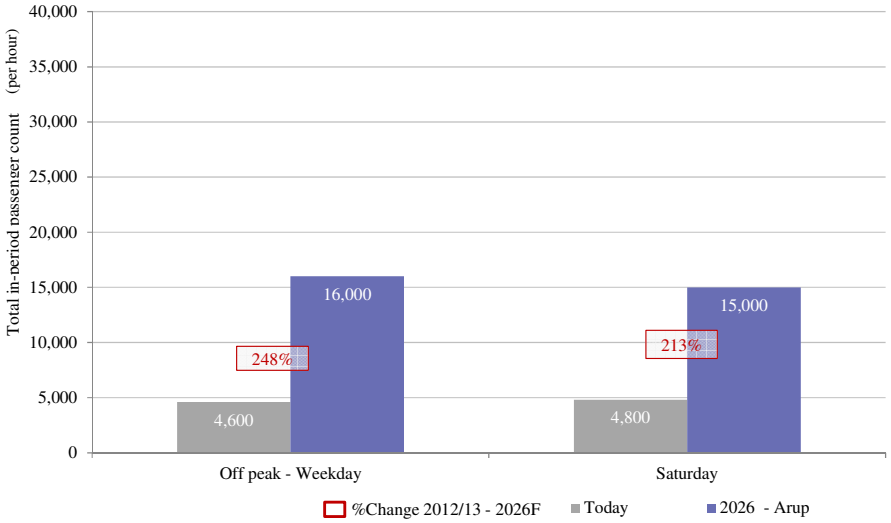

Figure (vii): Average TCR entries and exits (off-peak) now and according to Arup projections

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Executive Summary

Tottenham Court Road entries and exits

During the average weekday afternoon peak, it is projected that 38,000 passengers per hour will enter and exit Tottenham Court Road Station via five access points. It is projected that around half of all users will enter/exit the station via the two access points to the west of Tottenham Court Road, whilst the other half of entries and exits will occur via the three access points to the east.

Given activity along Oxford Street and in Soho, it is projected that one third of all entries and exits will occur via Dean Street. Significant redevelopment of the St Giles area, along with new access points to Crossrail, is likely to shift a portion of demand East and South.

During the average weekday off peak period, it is projected that 16,000 passengers per hour will enter and exit Tottenham Court Road Station. Busy summer Saturdays are anticipated to match average weekday off-peak periods. During the busiest summer period and in the Saturday off-peak period, it is projected that 15,000 passengers per hour will enter and exit Tottenham Court Road Station. However, the busiest pre-Christmas period will see a surge in off peak demand, projected to reach some 21,000 entries and exits per hour.

Executive Summary

Findings: Farringdon

As shown in the figure (viii) projections indicate that Farringdon station could achieve demand of some 41 million passengers per annum and, on average, some 153,000 passengers per day in 2026. These figures represent an increase of some 150% compared to current totals and 50% compared to a projection based upon Crossrail Ltd's current approach.

As shown in the figures below, as with the other stations, Arup projections indicate that demand could increase very significantly relative to current gate flows at the station.

Given the potential for area development and the large numbers of passengers projected at other stations, it is possible that demand at Farringdon will be above the levels provided.

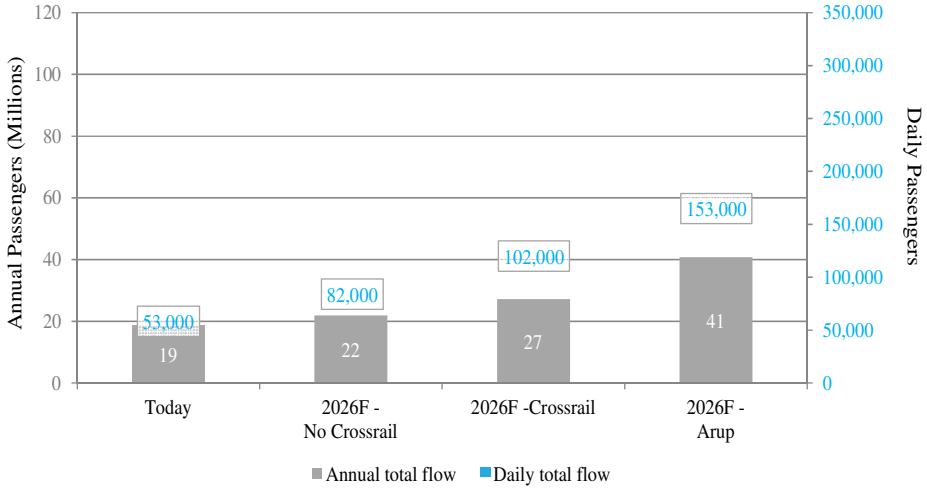

Figure (viii): Farringdon *passengers* now and according to Crossrail and Arup projections

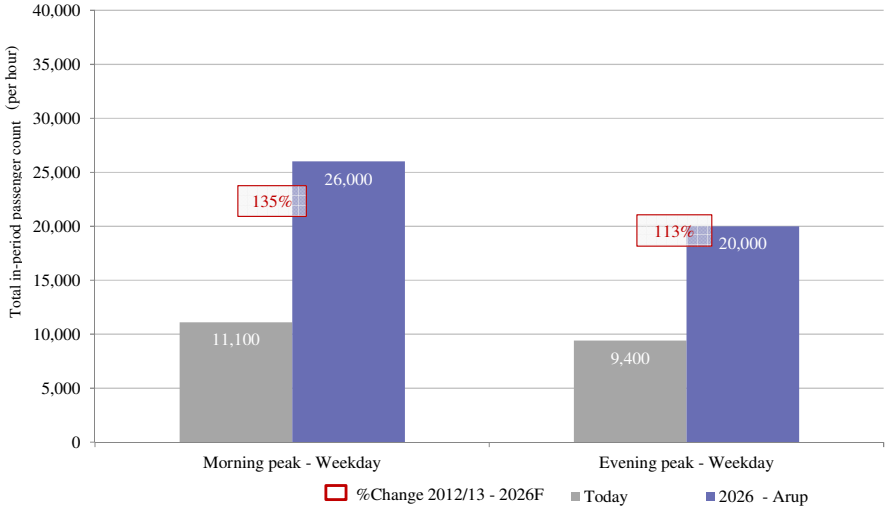

Figure (ix) Average Farringdon entries and exits (peak) now and according to Arup projections

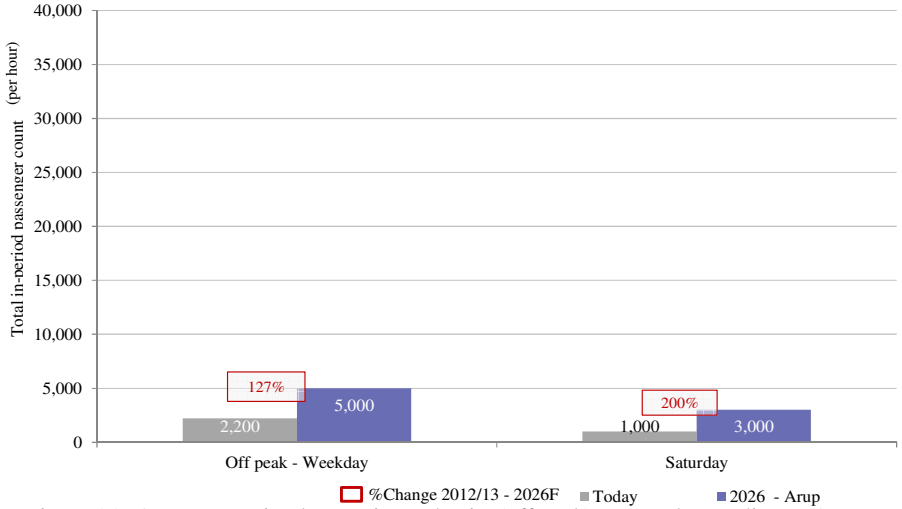

Figure (x): Average Farringdon entries and exits (off peak) now and according to Arup projections

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Executive Summary

Farringdon entries and exits

During the average weekday afternoon peak, it is projected that 20,000 passengers will enter and exit Farringdon Station via two access points. The majority of visitors (13,000 per hour) are projected to enter/ exit via the western entrance on Cowcross Street, with the remainder (7,000 per hour) using the eastern entrance on Long Lane. New development in the area comprises the proposed office and retail development above the western and eastern ticket halls and the redevelopment of St Bartholomew's Hospital.

Passenger demand during the weekday off-peak and weekend periods are substantially lower than during the weekday peak, reflecting the area's primary role as centre of employment. During an average Saturday afternoon, it is projected that 3,000 passengers per hour will enter and exit Farringdon Station via two access points. We consider it remains possible that additional neighbourhood development – or indeed crowding around other Central London stations – could precipitate higher levels of demand for Farringdon station.

Executive Summary

Conclusions & Recommendations

Our indicative projections show that demand levels used to determine station and service capacity along Crossrail will be achieved more quickly than originally forecast. Our analysis indicates that in 2026, approximately 251 million people per annum will enter/exit Bond Street, Tottenham Court Road and Farringdon stations. Combined demand for these three stations is projected to be three times greater than at present.

Projected growth indicates a tremendous opportunity for businesses operating in Central London. Retailers and the food and beverage sector in particular, could benefit from increased footfall. Capitalising upon the opportunities additional visitors bring will however, require a range of responses in order to ensure Central London's neighbourhoods remain unique, sought out visitor attractions and liveable, vibrant neighbourhoods for their residents and local businesses. Building on existing public realm improvements planned for Crossrail, pressures from growth will need to be managed and responded to imaginatively and effectively. Responses will need to take the form of active "city management". For example "dynamic" traffic management, greater use of public realm wardens, changes to policing and surface transport provision. Choices around pedestrianisation, improvements and changes to to bus routes, lighting and other investment in the public realm may need to be made.

These measures may well place further demands on the resources of both local authorities and BIDS. Such demands may need to be met through further resources being made available to the stakeholders tasked with meeting them.

Given data limitations, we have not been able to draw conclusions around the profile of passengers projected to be using the three Central London stations in question. Analysis being undertaken by TfL will present the opportunity to understand basic information on passengers profiles and to project journey purpose data according to time of day, day of week and season, informing decisions around urban realm improvements and management. This would be of very considerable value to the BIDS and their members.

Additional walking route modelling could also be useful to businesses. Whilst video visitor count data are available, they have not been analysed to specify typical walking routes in the area or to determine their popularity across different times and seasons. This sort of analysis along with pedestrian density modelling could be helpful to both public and private sector stakeholders.

We note that more sophisticated modelling that takes into account a wider range of demand factors and the potential for spatial re-distribution of demand could be useful in order to guide investment decision-making.

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Introduction

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Introduction

The New West End Company, inmidtown, the Fitzrovia Partnership and Transport for London (TfL) have commissioned Arup to undertake a review of Crossrail-related pedestrian and public transport demand forecasts for Bond Street, Tottenham Court Road and Farringdon Crossrail Station street-level areas. A map of the study area is shown in the figure, overleaf.

A primary focus of this study is to help stakeholders to better understand the likely impacts and opportunities for the areas of central London within their Business Improvement Districts (BIDs) as a result of future visitor demand from Crossrail.

Motivation & Scope

As part of the study, we have reviewed previous assumptions and datasets used to derive Crossrail passenger demand forecasts for the original Hybrid Bil1 (2004) and the subsequent update undertaken in 2010. The prior approach to modelling visitor numbers was appropriate, but several factors motivate extension of these forecasts.

First, population forecasts for Greater London continue to increase. Most recently, the latest GLA London Plan predictions, published in various policy documents, forecast the metropolitan population to reach some 10 million people by 2030. Crossrail has anticipated demand growth that outpaces original forecasts: stations are designed with excess capacity, and the pedestrianisation of Cowcross and Dean streets will help to mitigate impacts on the public realm arising from visitor number growth. It nonetheless is evident that significant changes to population forecasts raise important questions about public space in the study area.

Higher-than-forecast growth could necessitate additional public realm improvements and other changes, beyond the significant changes planned by Crossrail. For example, there could be a case for widening pavements beyond the stations' immediate public realm. Central London Business Improvement Districts (BIDs) could need to ensure operational funding for maintenance and security staff.

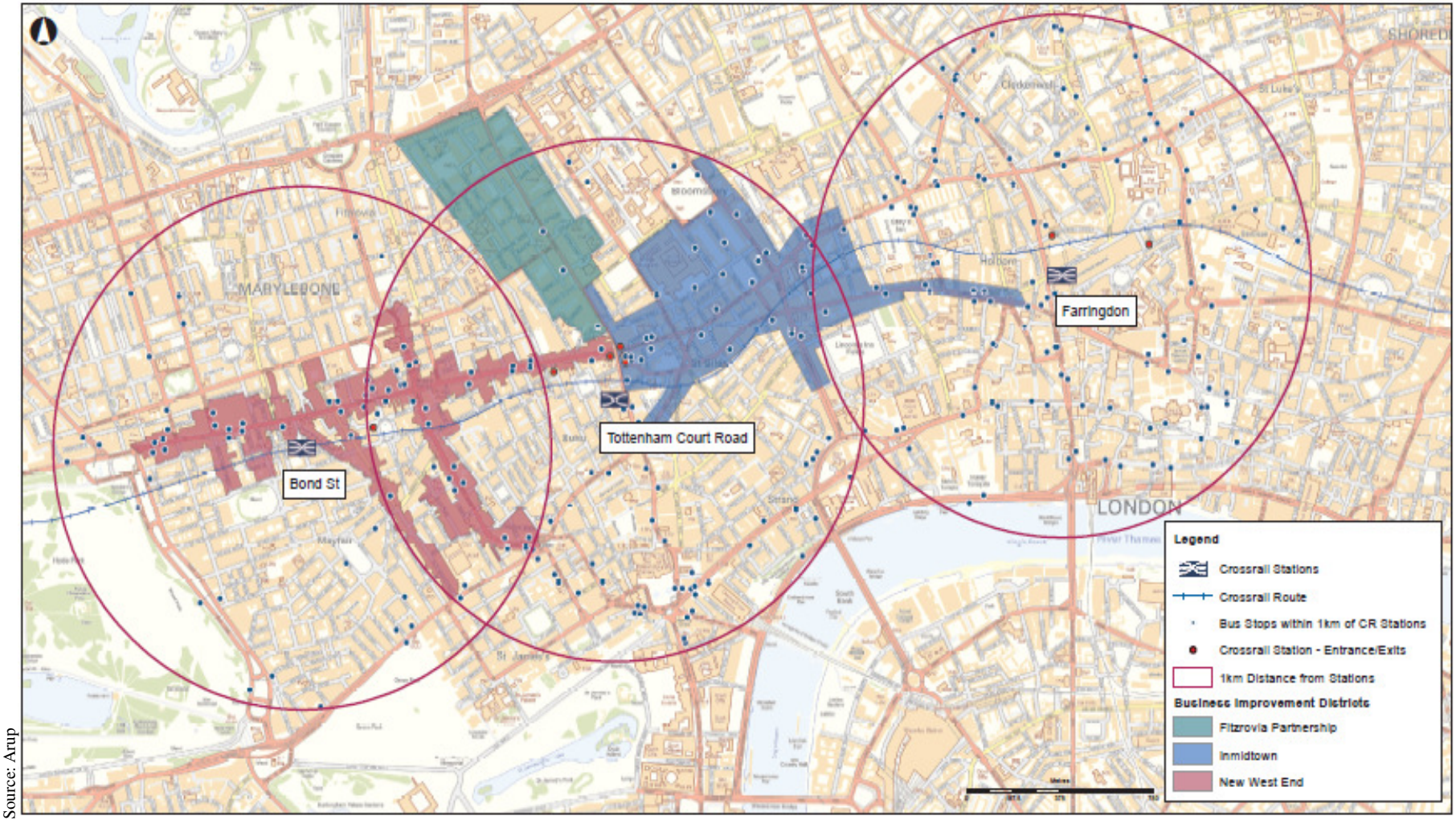
Second, the original forecasts examined demand for Crossrail service and stations during typical weekday peak hour(s). From a station design perspective, modelling based on the weekday commuter peak is sensible, ensuring the provided space and access points can cope with maximum demand. Local businesses, however, may be most interested in projected visitor counts at other times of the day, such as outside peak demand hours. Local businesses also are likely to be interested in projected seasonal changes in demand. For retailers in particular, forecast changes throughout the day and year could help them to begin to consider operating considerations with Crossrail's opening and development, capitalising on economic development opportunities.

We have sought to build on previous visitor projections made by Crossrail. Using several 'scenarios' of potential growth based on different population projections, we have incorporated a more granular examination of the stations' local areas, considering factors of particular interest to businesses operating in Central London.

This report presents our projections for individual station entrances and exits in 2026, taking into consideration local area developments and other factors. Commentary is provided on the data used within these previous forecasts. Areas where sensitivities or further research may be worthwhile are identified.

Introduction

The study focusses specifically on Crossrail passenger demand projections for the proposed Bond Street, Tottenham Court Road and Farringdon Crossrail Stations which are located in the vicinity of the three BID areas, as shown in the study area plan.



Source: Arup

Figure 1: Map of Central London Crossrail stations showing three Central London Business Improvement Districts (BIDs)

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Introduction

Approach

Our approach to modelling visitor numbers has combined analysis of demographic drivers with more detailed consideration of the local areas surrounding the three Central London Crossrail stations, Bond Street, Tottenham Court Road and Farringdon.

The process by which we have modelled station visitor projections is represented in the figure shown right. This approach represents a simple way to estimate the distribution of Crossrail trips at different times of day, week and year and also to indicate the impacts on footfall in the areas surrounding stations. Undertaking our analysis, our primary areas of focus have been:

- Identifying demographic and local impacts likely to have a bearing on Crossrail demand;
- Understanding how potential changes affect local visitor activity in the areas around Bond Street, Tottenham Court Road and Farringdon under revised growth assumptions;
- Clarifying how visitor activity could vary according to time of day, day or week and season of year in these areas; and
- Identifying next steps towards understanding how Crossrail will affect the public realm and demand for space locally.

A detailed description of our approach and method is provided at Appendix A. This methodology brief cites the dataset associated with each step of the process we have undertaken and notes simplifying assumptions.

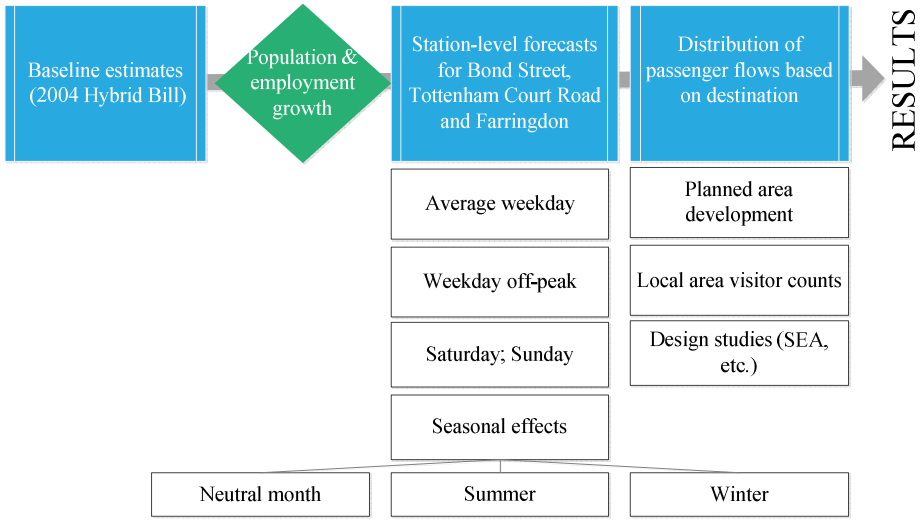

Figure 2: Process map describing Arup's approach

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Introduction

Limitations

We note that our approach provides only an indicative projection of future demand based upon a series of assumptions and factored relationships. These projections carry an intrinsic level of uncertainty. The resulting analysis only can provide an indication of the level of demand and impact that may occur in 2026.

Because we have derived our projections from station counts uplifted according, primarily, to population growth estimates, our projections may not wholly account for increases due to other factors. These other factors could include, for example, tourism growth. Crossrail's direct link to Heathrow is likely to yield a significant number of tourists travelling into and out of Central London stations throughout the day, beyond the traditional peak periods.

We have made a number of simplifying assumptions in order to complete our work. These assumptions have been necessary in order to build upon previous work completed by Crossrail Ltd. – extending projections to off-peak periods, modelling seasonality, and projecting demand beyond 2016, to 2026. For this reason, there is only limited comparability between our projections and Crossrail's previous forecasts.

2026 station demand profiles could differ materially from current station profiles. We have made the simplifying assumption that the demand profile for each station remains the same in 2026 as it is now. We also have assumed that variation across times, days and seasons in 2026 will be comparable to differences evident in 2012 and 2013 data.

The indicative projections we have provided represent unconstrained demand. Demand for the transport network will be influenced by capacity, and we have not considered the potential redistribution of demand amongst Central London stations with significant growth. Our approach does not account for the effects on the surrounding network or on other area Underground stations, including Marble Arch, Holborn and Oxford Circus.

Because we have used RailPlan[1] figures as the basis for preparing our report, our projections include journeys on other lines already included in RailPlan, such as Thameslink. However, Thameslink's development is likely be associated with a large number of workers and tourists transferring on and off Crossrail. This analysis has not accounted for the effects the new line will have upon station entry and exits. Especially at Farringdon station, Thameslink could lead to a higher volume of entries and exits than indicated.

There have been considerable limitations to our ability to model walking routes from stations and to project the distribution of onward journeys. Whilst RailPlan indicates the distribution of exits from a given station by area, it does not specify walking routes taken in order to complete pedestrian journeys. We have attempted to supplement our understanding by reviewing footfall counts taken by New West End Company, indmidtown and their partners. We have not drawn conclusions about the future profile of station users or their journey purpose. There may be opportunities to understand potential future users based on emerging TfL analysis.

[1] RailPlan is TfL's London-wide public transport demand model covering Underground, Overground, National Rail, DLR tram and bus services.

Introduction

Methodology

We have used population and employment forecasts as the basis for four 'macro-scenarios' describing Crossrail user demand in 2026 at each station. Crossrail demand is projected for each of the following scenarios:

- The 2004 estimate of total demand used to support the Hybrid Bill, based on RailPlan;
- The 2010 revised Crossrail demand estimate based upon updated population growth forecasts in RailPlan;
- The 2012 revision to population forecasts provided in the *London Plan;* and
- Latest estimated London Plan population growth as published in the context of current transport policy planning such as the Roads Task Force.

The basis for our projections are the weekday afternoon peak figures originally presented by Crossrail. We have applied changes in demographic trends to our analysis of visitor forecasts at the three stations by uplifting these originals according to various factors. A snapshot of these factors is included at Appendix A.

Station-by-station passenger demand forecasts are modelled for each planned entrance/exit and given according to:

- Time of day (morning and evening peak; off-peak);
- Day of week (weekday; weekend);
- Time of year (neutral month, peak winter; peak summer);
- Onward journey and effect on the local network.

Assumptions

In modelling the macro-effects of population and employment growth we have made the following assumptions:

- The distribution of growth to 2026 remains as indicated by 2010 London Plan update;
- Growth outside London follows the pattern predicted by the ONS 2010 Subregional Population Predictions, with greater than average growth in the East of England.

In forecasting station-by-station entry and exits, we have made the following general assumptions:

- The distribution of station entry/exits at the peak period broadly remains in line with the distribution originally forecast by Crossrail;
- For off-peak and weekend directional distributions, it has been assumed that a slightly higher proportion of passengers travels via the 'main' direction (e.g. via Oxford Street).
- New property development affects the distribution of entries/exits but not aggregate demand.

It should be noted that differences in available data mean the bases for station entry and exit projections vary between our three station forecasts. Moreover, different bases for preparing summer, winter and "neutral" forecasts lead to variations in the calculated projections according to season and day, etc. for each individual station. Unless otherwise noted, we refer to neutral forecasts, as these projections provide the best sense of average demand. We note important assumptions and sources of information as appropriate.

Introduction

Sources of data and information

The following sources have been used in order to complete our population and employment-based 'macro' station forecasts:

- Crossrail forecast passenger volumes provided by Crossrail Ltd. and Transport for London (TfL);
- Transport assessments provided by Crossrail Ltd.;
- Greater London Authority population and employment projections accessed via the Greater London Authority London Data Store;
- Regional population and employment growth projections accessed via the Office of National Statistics (ONS).

The following sources have been used in order to model hourly and seasonal variation and station entry/exit distributions:

- TfL September 2012 to August 2013 daily station visitor counts and September 2013 hourly station entry/exit counts;
- Representative (2011; 2012) pedestrian visitor counts, compiled via footfall cameras, provided by springboard and NWECo.;
- "Retailing inmidtown" (2012), provided by the BID;
- "Evaluating Future Retail Opportunities in the St Giles Area" (2012), GVA on behalf of NWEC and inmidtown;
- Crossrail Bond Street Station Entrances Pedestrian Study, 2011;
- Crossrail Urban Integration Design Reports for each of the three stations;
- Farringdon Urban Design Study - Pedestrian Movement and Analysis for Crossrail Limited, Atkins, June 2009;
- Arup research of planned commercial and residential developments in the study area;
- Further Guidance for Bond Street and Tottenham Court Road, 2007;
- Crossrail Design and Access Statements; and
- MVA Logit based assessment reports of likely use of Station accesses.

We note that the data from TfL, in part including summer 2012, cover a period when traveller flows may have been affected by the London Olympic and Paralympic Games.

Additional sources are noted at Appendix B of this report.

Central London station demand projections

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Central London station demand projections

Introduction

This section provides a brief overview of recent population and employment forecasts and demonstrates the effects projected London and regional population and employment growth could have on the number of Crossrail users.

Population forecasts

Accounting for changes projected in regional population and employment forecasts, we have projected demand for Crossrail's Central London stations according to the four 'scenarios' listed below. New population and employment data presents an opportunity to update Crossrail's figures.

- The 2004 estimate of total demand used to support the Hybrid Bill, based on RailPlan; the standard public transport assignment model, used by TfL;
- The 2010 revised Crossrail demand estimate based upon updated population growth forecasts;
- The 2012 revision to population forecasts provided in the London Plan;
- Latest estimated population growth from the GLA as used in the context of the Roads Task Force and other policy planning estimates.

The Hybrid Bill forecasts undertaken in 2004 serves as the baseline of our analysis. These forecasts were produced using the London Plan-based London Transport Studies (LTS) model (version B3.2). London Plan and 1991 Census data were input into the Railplan modelling to forecast demand for the years 2001 and 2016.

Actual population growth has outpaced these forecasts. Revised Crossrail demand forecasts undertaken in 2010 were based upon an updated version of the LTS (version B5.4) and 2001 Census data. This information was input to the RailPlan model to derive 2016 and 2026 passenger demand forecasts.

We have updated these forecasts according to the 2012 revision to the GLA population and the latest estimated population growth used in the context of policy planning and presented in the Roads Task Force. As possible, we have noted the effects of population growth outside the Greater London Authority (GLA) in reassessing original Hybrid Bill forecasts.

We have based station-by-station analyses, presented in the next section of this report, on the most recent population and employment forecasts for 2026.

Central London station demand projections

Greater London Authority (GLA) population growth forecasts

Figure 3 shows the GLA population forecast used to support Crossrail's 2004 Hybrid Bill and subsequent revisions to the population forecast found in other government documents. These forecasts have been revised and increased, and the most recent projection from the GLA forecasts a London population of some 10 million people by 2030. These forecasts are more than 11% greater than the population forecasts used to determine Crossrail demand as part of the Hybrid Bill.

Population forecasts by borough

Figure 4 shows a breakdown of the most recent population forecast according to Borough. The London Borough of Camden and City of Westminster, in which the two of the Central London Crossrail stations will be located, each are projected to have a population in excess of 240,000 people. These figures represent growth of some 11% relative to the estimates presented in the London Plan. As a whole, the population of Greater London is forecast to increase by some 15% between 2011 and 2026.

As these figures indicate, growth is forecast to be higher in London's outer boroughs than in the centre. It is forecast that Central London will comprise some 0.7 million people in 2026, increasing some 11% relative to 2011. Outer London will comprise some 5.9 million people in 2026, increasing some 19% relative to 2011. The largest proportional rise comes in Inner London boroughs outside of the Central London area, growing by 28% to 3.4 million.

Source: GLA projections

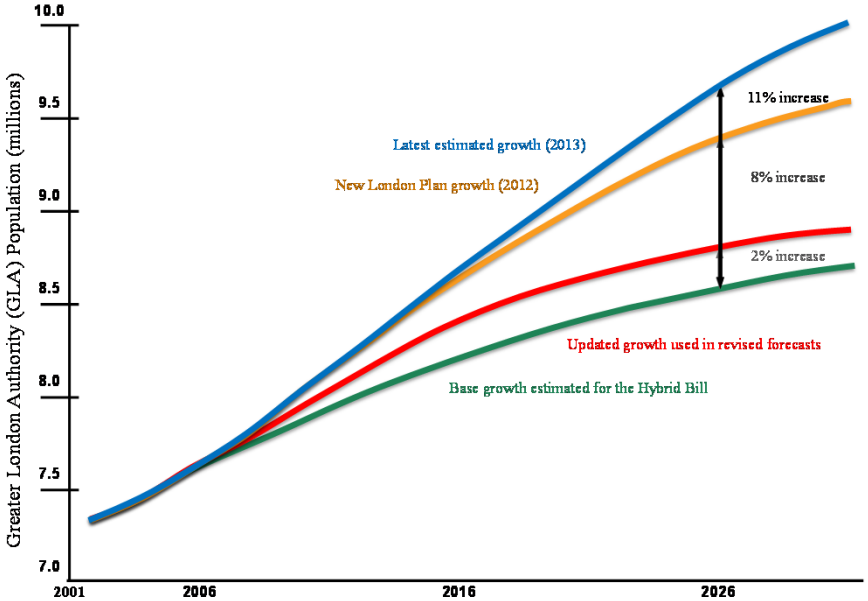

Figure 3: Comparison of London population forecasts

Source: GLA 2012 Projections

London population forecast by borough (000s)

	Greater London	LB Camden	City of Westminster
2011 Population	8,205	220	220
2026 Population (E)	9,422	245	243
% Growth	**14.8**	**11.2**	**10.9**

Figure 4: London population forecasts by borough (Note, latest estimates of 10 million population by 2030 would see the Greater London 2026 estimate rise to 9.64 million)

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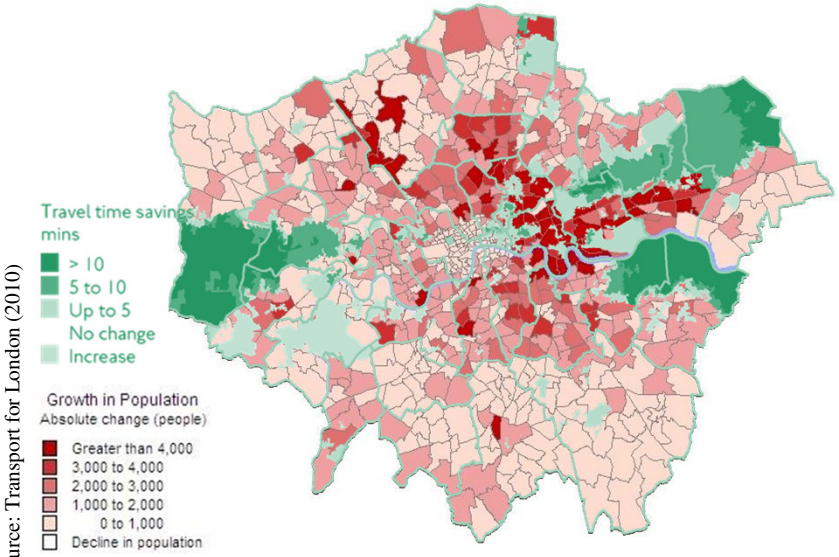
Central London station demand projections

Regional population forecasts

Crossrail will enable stronger connections between the London's inner and outer boroughs and suburbs. Figure 5 shows that the regions of the Capital enjoying the most significant travel time savings, defined as a reduction in travel time to Central London of more than 10 minutes, correspond to those anticipated to increase in population significantly. The Office of National Statistics (ONS) has forecast that, within the GLA, the populations of Havering, Greenwich and Bexley, directly connected to the Central London via Crossrail, will increase by some 16% between 2011 and 2026.

Crossrail will connect Central London to a growing regional population. It is forecast that a significant portion of national population growth will occur east of the GLA: only in London and the East does the ONS forecast population growth to outpace England as a whole. As shown in Figure 6, the ONS has forecast population growth in London and the East of England of some 19% and 15%, respectively, between 2011 and 2026. The population of the South East is projected to increase some 10%.

In the East, the ONS forecasts the population of Brentwood, Crossrail's eastern terminus, will increase some 15% between 2011 and 2026. The populations of nearby Uttlesford and Colchester are projected to increase at rates amongst the highest in the country, some 21% by 2026. As a whole, it is projected that the population of Essex will increase 15% by 2026. In the South East, the ONS projects the population of Windsor and Maidenhead, Crossrail's western terminus, to increase some 16% between 2011 and 2026. The population of adjacent Slough is projected to increase some 19% in the same period.



Source: Transport for London (2010)

Figure 5: GLA population growth (2010-2031); anticipated Crossrail time savings

Regional population forecast (000s)

	2011	2026E	% Change
London	8,205	9,422	19.2%
East	5,826	6,688	14.8%
South East	8,561	9,466	10.3%
England	52,655	58,983	12.0%

Note: London figures are 2011 GLA Economics data; all remaining figures are 2010 ONS estimates, including 2011 population.

Source: Office of National Statistics

Figure 6: Regional population forecast

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Central London station demand projections

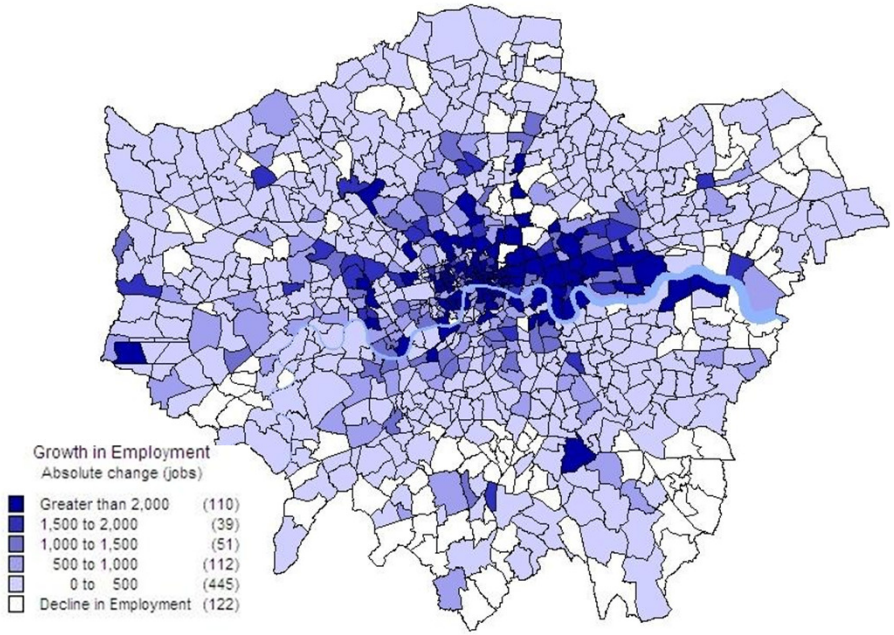
The continued importance of the West End, Fitzrovia & Midtown

Central London will remain the capital's employment and population base. The London Plan forecasted employment growth of some 750,000 jobs between 2010 and 2031, reaching 5.45 million in that year. As shown in Figure 7, the distribution of growth was forecast to be concentrated in the Docklands, the City and the West End – areas in which significant amounts of developable land remain. At the time this forecast was made, TfL anticipated 27 million trips per day would be made across the network by 2031, focused on journeys in and out of Central London.

As with population forecasts, more recent projections have revised future employment estimates higher, stressing the importance of the commuter transport network. The City of London recently has forecast that total employment in Greater London will surpass 5.2 million by 2015 and 5.5 million by 2020 – more than a decade earlier than anticipated in the London Plan. City of London projections show that employment growth in the City of Westminster will outpace the GLA as a whole for the next several years by some 0.3% to 0.4% per annum.

The effect of population growth on Crossrail demand

The charts, overleaf, apply different population and employment scenarios (as described on page 10) to the Crossrail demand forecasts presented in the 2004 Hybrid Bill. We compare current station visitor numbers to visitor numbers projected in 2026.



Source: Transport for London (2010)

Figure 7: Distribution of London's forecast employment growth (2010-2031)

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Central London station demand projections

Indicative demand projections: Central London stations in 2026

The figures below compare average projected demand at each station, based on the most recent population and employment projections, with actual total entries/exits over the last year, recorded by London Underground, and with 2026 forecasts derived from Hybrid Bill (2004) figures.

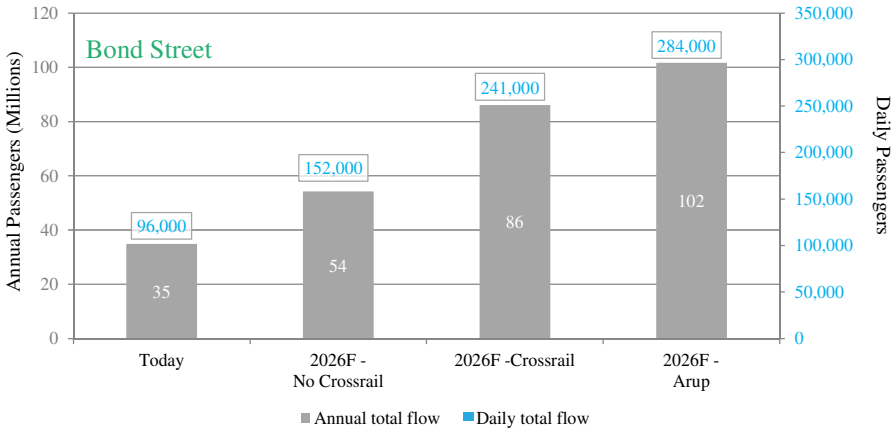

Figure 8: Bond Street station

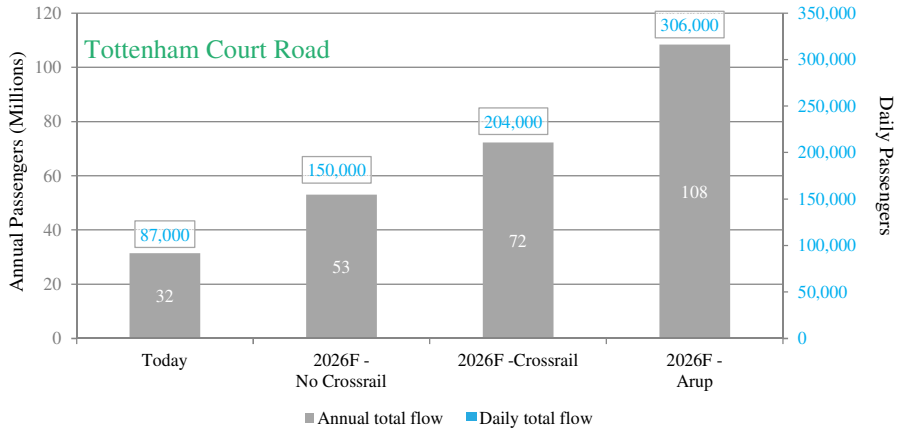

Figure 9: Tottenham Court Road station

Significant growth is projected relative to current station visitor numbers. Annual projections, based on most-recent population and employment estimates, indicate 67m, 77m and 22m *additional* passengers will use Bond Street, Tottenham Court Road and Farringdon stations, respectively, in 2026. On a daily basis, these figures translate to an additional 187,000, 217,000 and 84,000 each day at the three respective stations.

Projections based upon up-to-date population and employment forecasts predict higher visitor number counts than uplifted figures presented in the original Hybrid Bill. The difference is greatest at Tottenham Court Road station, where an *additional* 36 million users are projected using the latest population figures.

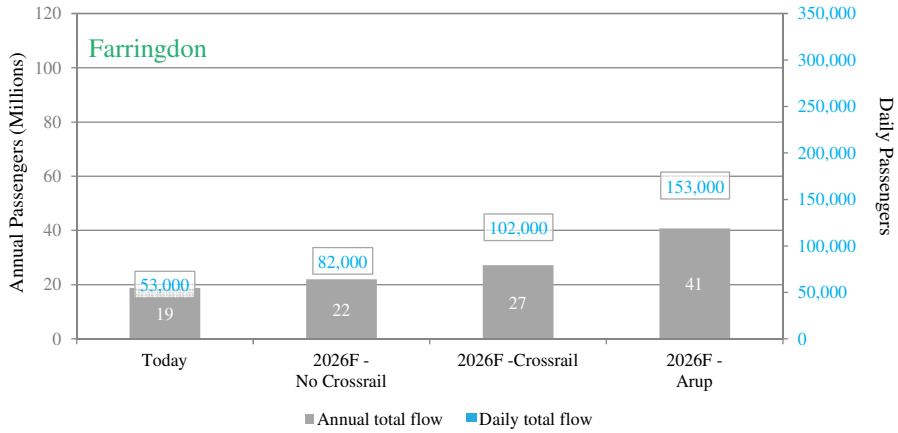

Figure 10: Farringdon station

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Crossrail user projections

Projections: Central London stations in 2026

The figures below compare projected station totals, based on the most recent population and employment projections, with current station user counts and with previous forecasts.

Bond Street

Updated forecast's increase compared to…	% Change
Hybrid Bill (2004) forecast of 2026	18%
2012 actual user volume	191%
Forecast station user growth without Crossrail	88%

Note: Updated projection based on most recent population and employment figures. Projection is for a representative 'average' month.

Figure 11: Bond Street station

Tottenham Court Road

Updated forecast's increase compared to…	% Change
Hybrid Bill (2004) forecast of 2026	50%
2012 actual user volume	243%
Forecast station user growth without Crossrail	104%

Note: Updated projection based on most recent population and employment figures. Projection is for a representative 'average' month.

Figure 12: Tottenham Court Road station

Farringdon

Updated forecast's increase compared to…	% Change
Hybrid Bill (2004) forecast of 2026	50%
2012 actual user volume	116%
Forecast station user growth without Crossrail	86%

Note: Updated projection based on most recent population and employment figures. Projection is for a representative 'average' month.

Figure 13: Farringdon station

Bond Street

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Bond Street

Introduction

This section presents primary assumptions and analysis of Crossrail visitors projections for Bond Street station and its vicinity. We have projected visitor entries and exits for each of the station access points according to:

- Time of day (morning and evening peak; off peak);
- Day of week (weekday and weekend day); and
- Season of year (winter and summer).

Station entry and exit counts

On average, up to 285,000 users are projected daily in 2026 at Bond Street station. Average and seasonal forecasts are presented on the next two pages of this section. We have uplifted current TfL station-level entry and exit counts to project Crossrail demand for the station in 2026, using data from the GLA, TfL and Crossrail. We detail station-by-station TfL data in Appendix C.

Footfall video visitor count data

We have supplemented our understanding of entries and exits by reviewing visitor count data taken by footfall video cameras in the surrounding area. A map of these camera locations is included at Appendix D.

Planned developments in the station vicinity

We have attempted to account for potential changes in entry and exit flows by considering residential and commercial developments planned for the station area. These developments are noted in the maps presented in the following pages, which highlight seasonal and time-of-day changes in station demand projections.

User profiles

Currently available journey purpose data shows only network-wide user profile information for Inner London, Outer London and the capital as a whole. Information is not available on a station-by-station or line-by-line basis. For this reason, we have not sought to draw conclusions from the currently available TfL data. Additional analysis, currently being completed by TfL, could present an opportunity to analyse passenger volumes according to journey purpose.

West End visitor data collected by CB Richard Ellis (CBRE) provides an indication of pedestrian journey purpose on Oxford, Regent and Bond Streets. We detail TfL network-wide user profiles and CBRE data in Appendix E of this report.

It is clear from CBRE data that the West End cannot be understood as an employment base alone. Data provided supports an image of the West End as the destination for a broad mix of journey purposes amongst station arrivals and departures.

Across the year, international tourists and tourists from the UK together comprise 45% of West End visitors to Bond Street, Regent Street and Oxford Street. Applied to forecasted demand for Bond Street in 2026, this percentage indicates some 45 million entries and exits per year at Bond Street station related to retail and shopping. This total assumes no change in the mix of visitors to the area.

Bond Street

Projections: Bond Street in 2026

The figure, right, compares recent London Underground station entries and exit counts, taken in the first week of September 2013, with entry and exits projected for a similar month in 2026.

September data is useful because it is considered a "neutral" month – one in which demand is unaffected by factors such as seasonal holidays and/or leave. We have based projected neutral month entries and exits upon TfL visitor counts from September 2012 and 2013, noting the effect of the Olympic Games in 2012.

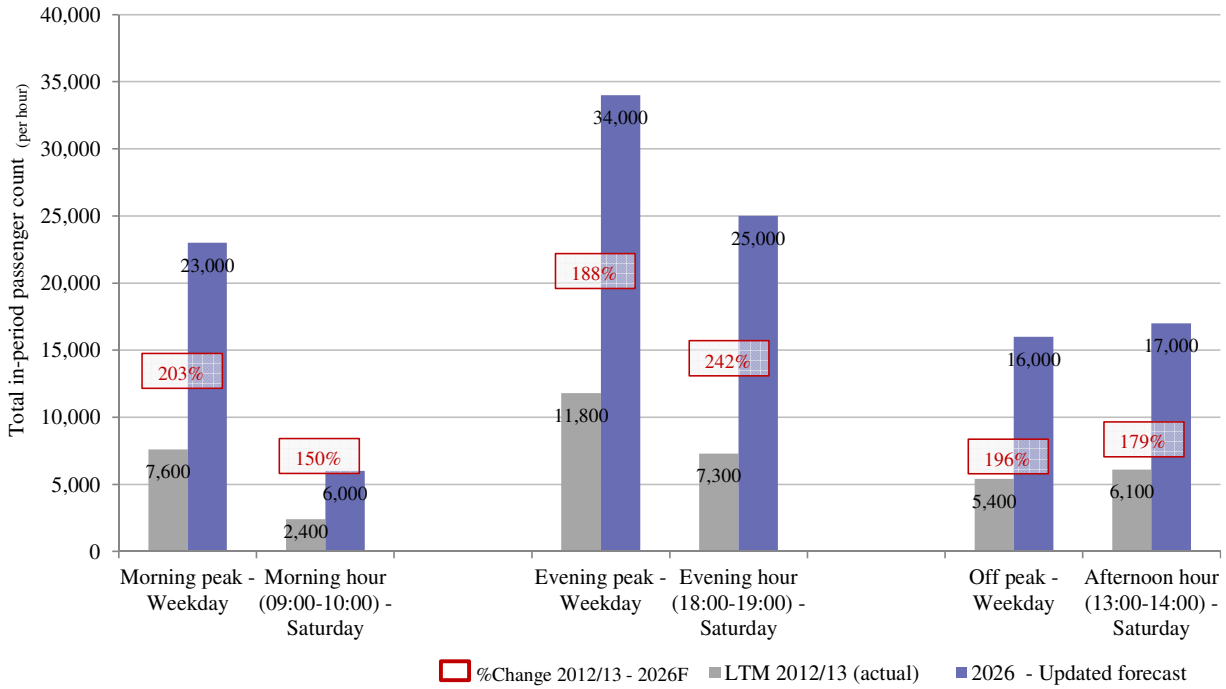

Figure 14: Comparison of visitor entries/exits in an average month with September 2013 data. Each bar represents a single hour. The single-hour peak represents an average hour of the three-hour period.

Findings

Crossrail visitor numbers projected for Bond Street are highest during the weekday evening peak, when it is projected some 34,000 people will enter/exit the station. On Saturdays during "neutral" months, forecasts based on most recent population and employment figures project evening peak traffic at the station to be some 25,000, declining one quarter from the same weekday evening hour. This scenario shows that weekend evening hour passenger demand will increase some 250% from current levels.

Off-peak passenger demand is higher on Saturdays than during the week. An additional 1,000 people will use the station during the Saturday off-peak period, in which 17,000 people will visit Bond Street station. Unsurprisingly, it is projected that weekend morning passenger demands will be significantly lower than weekday morning passenger demands (75%). Weekday morning peak demand is projected to double at the station in 2026.

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Bond Street

Projections: Seasonal variation in 2026

The figures, right, compare station visitors projected by season. Unlike the visitor count projections shown on the previous page, these forecasts are for periods likely to be affected by seasonal holidays and leave – the summer and winter seasons. The figure on top right shows projected weekday passenger demand. The figure on bottom right shows projected Saturday passenger demand. As before, the numbers shown represent total entries *and* exits.

The basis for these projections is the *maximum* number of entries and exits – rather than the average number, as previously shown – occurring in a given period. Each bar in the tables, left, represents projected demand within a single hour. Appendix C shows data provided by TfL supporting these projections.

It is typically the case that station user numbers are higher in winter months than in summer months. On average, it is projected that winter visitor counts will be some 8% higher than summer visitor counts.

Up to 47,000 people will visit Bond Street station during the winter weekday evening peak. Visitor numbers during the evening peak vary significantly according to season and time of day: the projected evening peak maximum decreases to 33,000 people during summer Saturdays.

Changes in off peak demand between seasons and days of the week are minimal when comparing maximum demand.

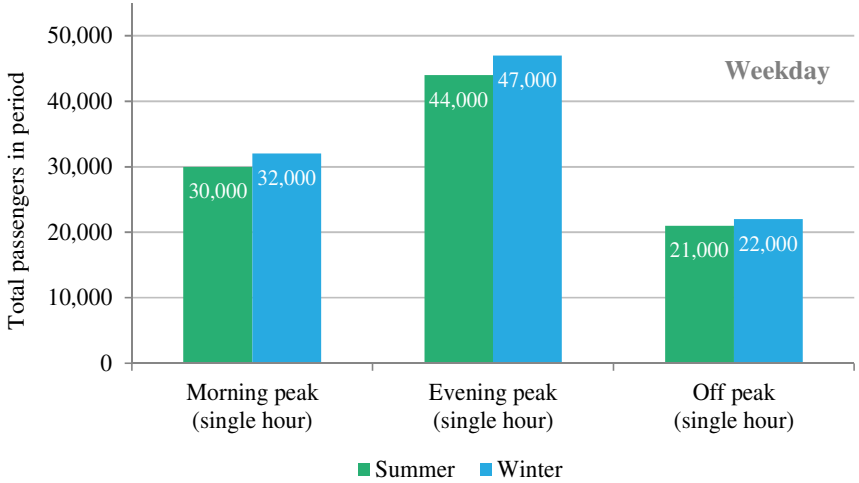

Figure 15: Seasonal comparison of weekday *maximum total* entries *and* exits projected within a *single hour* period. "Peak" represents an average hour of the three-hour peak.

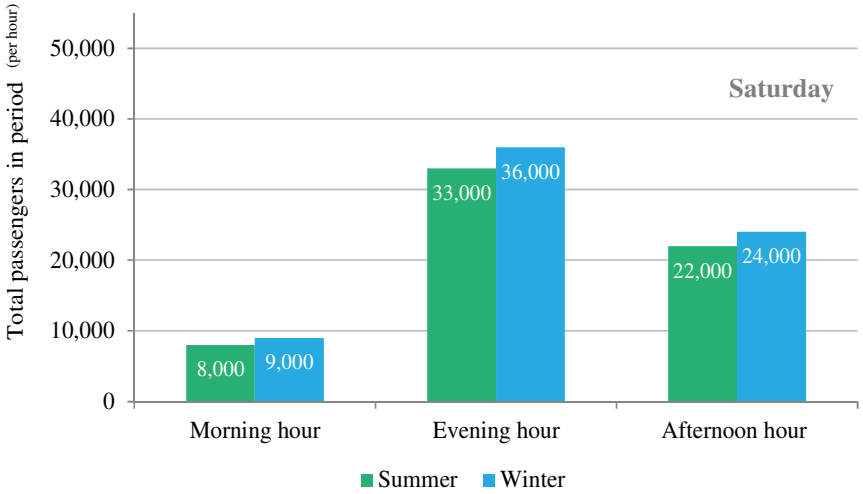

Figure 16: Seasonal comparison of Saturday *maximum total* entries *and* exits projected within a *single hour* period. "Evening" and "afternoon" times as shown on previous page.

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Bond Street

Planned development in the vicinity of the station

Site ID	Building/Site address	Type	Size (square metres)	Unit count	Year expexted
1	American Embassy	Mixed use	20,903	-	2019
2	22 Grosvenor Square	Residential	-	31	2015
3	55 Duke Street	Mixed use	12,650		Completed 2013
4	57 Duke Street	Mixed use	12,650		Completed 2013
5	65 Davies Street (above western ticket hall Bond Street)	Commercial	6,039		2019
6	18-19 Hanover Square	Ticket hall commercial	-	-	2019

Note: Arup analysis of publicly available planning reports and consultancy documents for indicative station exit modelling purposes only; there is some potential for double counting of units between redevelopment areas and individual sites. We have endeavoured to verify these figures with public authorities but no reliance should be placed upon size/unit count or delivery information.

Bond Street

Projected entry and exit counts: September ("neutral month") weekday, afternoon peak

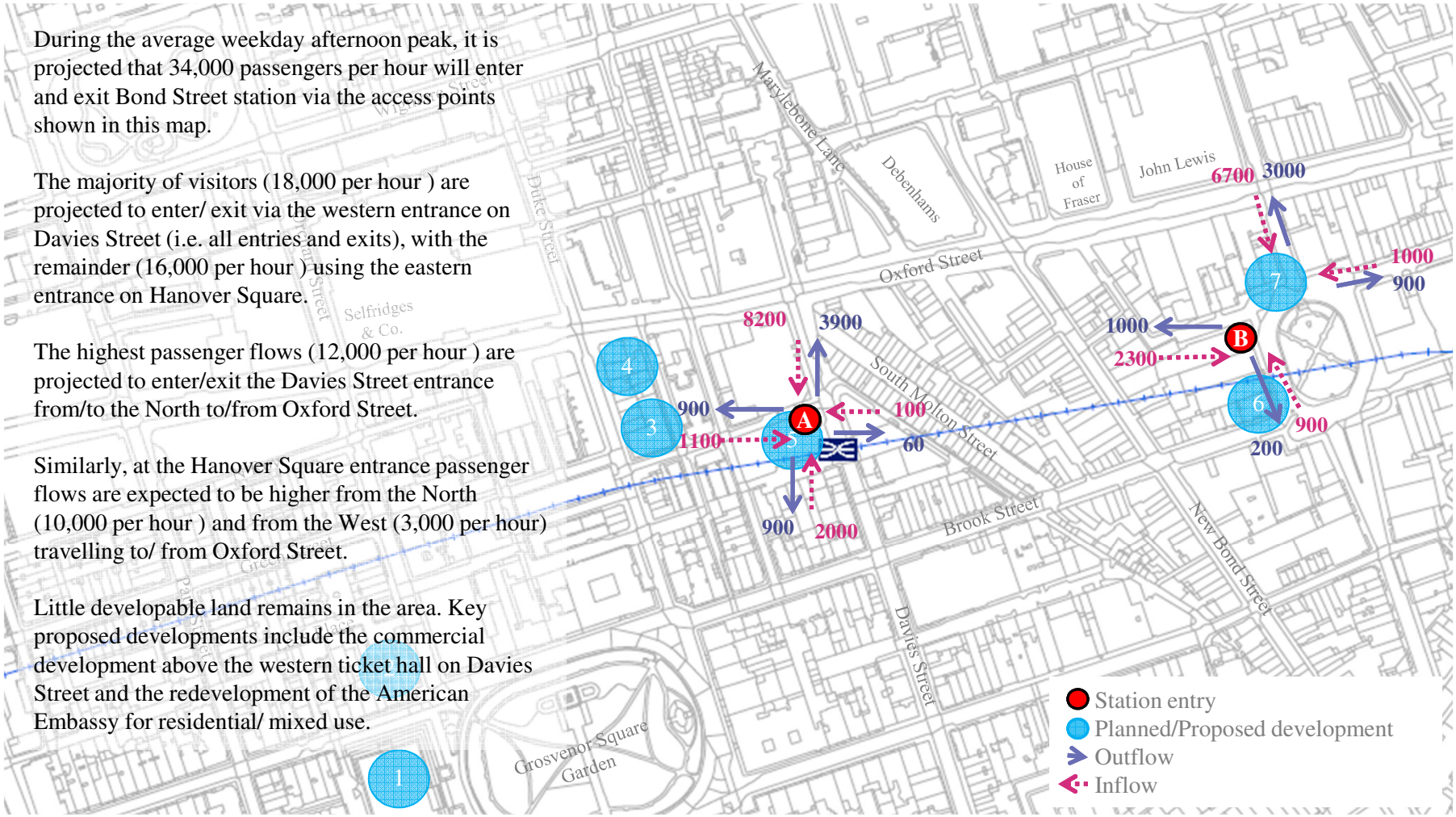
During the average weekday afternoon peak, it is projected that 34,000 passengers per hour will enter and exit Bond Street station via the access points shown in this map.

The majority of visitors (18,000 per hour) are projected to enter/ exit via the western entrance on Davies Street (i.e. all entries and exits), with the remainder (16,000 per hour) using the eastern entrance on Hanover Square.

The highest passenger flows (12,000 per hour) are projected to enter/exit the Davies Street entrance from/to the North to/from Oxford Street.

Similarly, at the Hanover Square entrance passenger flows are expected to be higher from the North (10,000 per hour) and from the West (3,000 per hour) travelling to/ from Oxford Street.

Little developable land remains in the area. Key proposed developments include the commercial development above the western ticket hall on Davies Street and the redevelopment of the American Embassy for residential/ mixed use.



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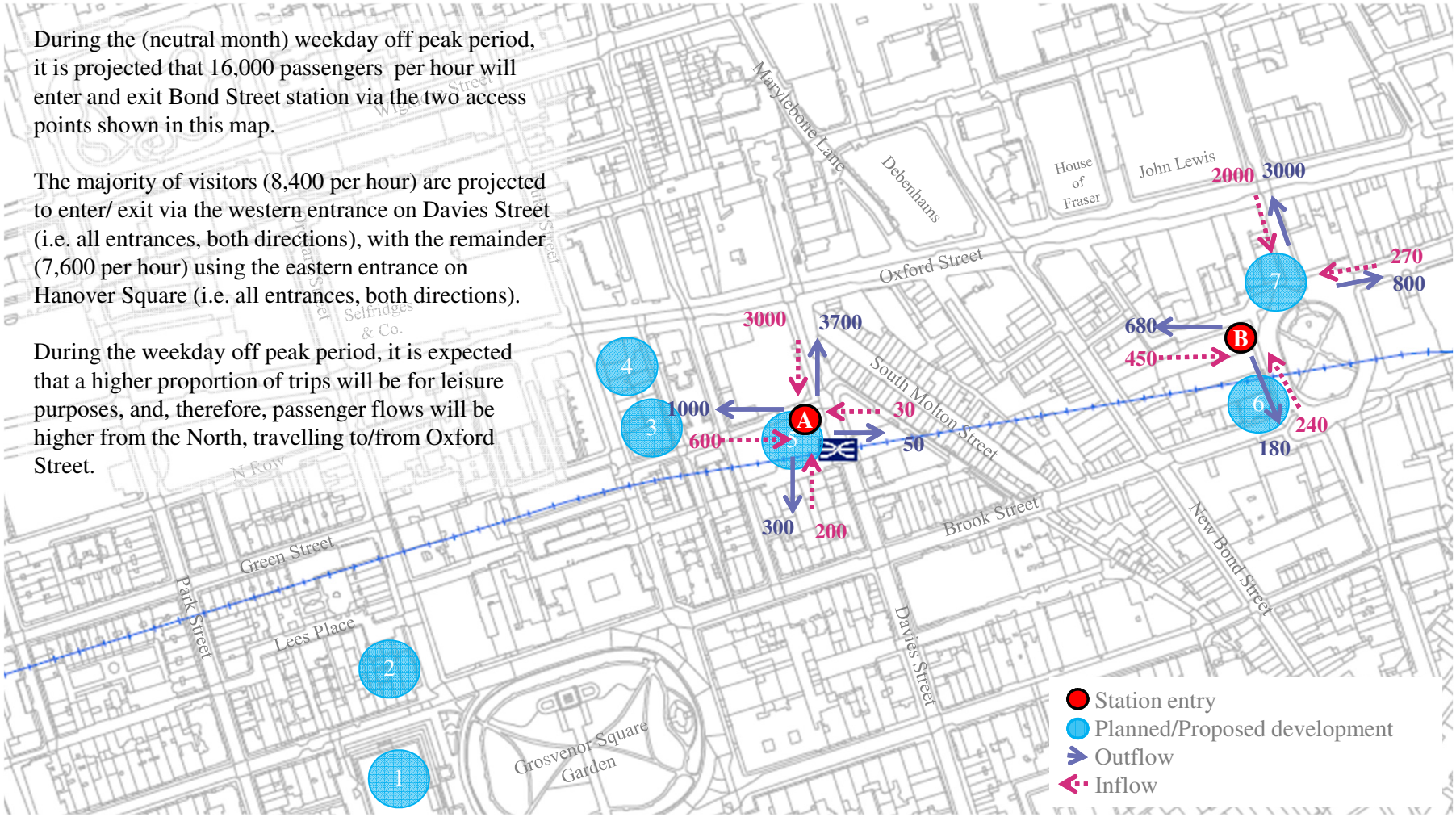
Bond Street

Projected entry and exit counts: September ("neutral month") Weekday, off peak

During the (neutral month) weekday off peak period, it is projected that 16,000 passengers per hour will enter and exit Bond Street station via the two access points shown in this map.

The majority of visitors (8,400 per hour) are projected to enter/ exit via the western entrance on Davies Street (i.e. all entrances, both directions), with the remainder (7,600 per hour) using the eastern entrance on Hanover Square (i.e. all entrances, both directions).

During the weekday off peak period, it is expected that a higher proportion of trips will be for leisure purposes, and, therefore, passenger flows will be higher from the North, travelling to/from Oxford Street.



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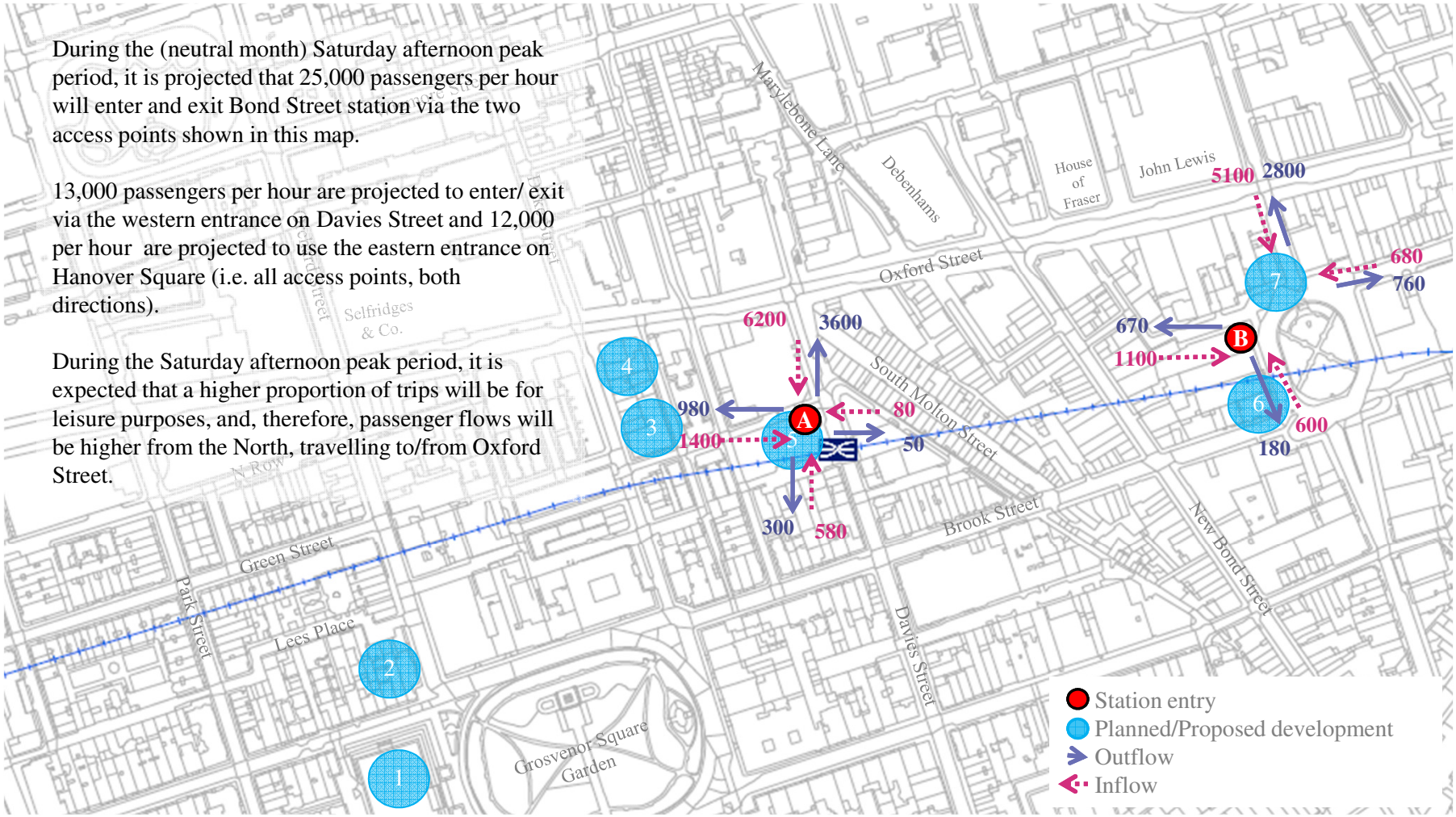
Bond Street

Projected entry and exit counts: September ("neutral month") Saturday, evening hour

During the (neutral month) Saturday afternoon peak period, it is projected that 25,000 passengers per hour will enter and exit Bond Street station via the two access points shown in this map.

13,000 passengers per hour are projected to enter/ exit via the western entrance on Davies Street and 12,000 per hour are projected to use the eastern entrance on Hanover Square (i.e. all access points, both directions).

During the Saturday afternoon peak period, it is expected that a higher proportion of trips will be for leisure purposes, and, therefore, passenger flows will be higher from the North, travelling to/from Oxford Street.



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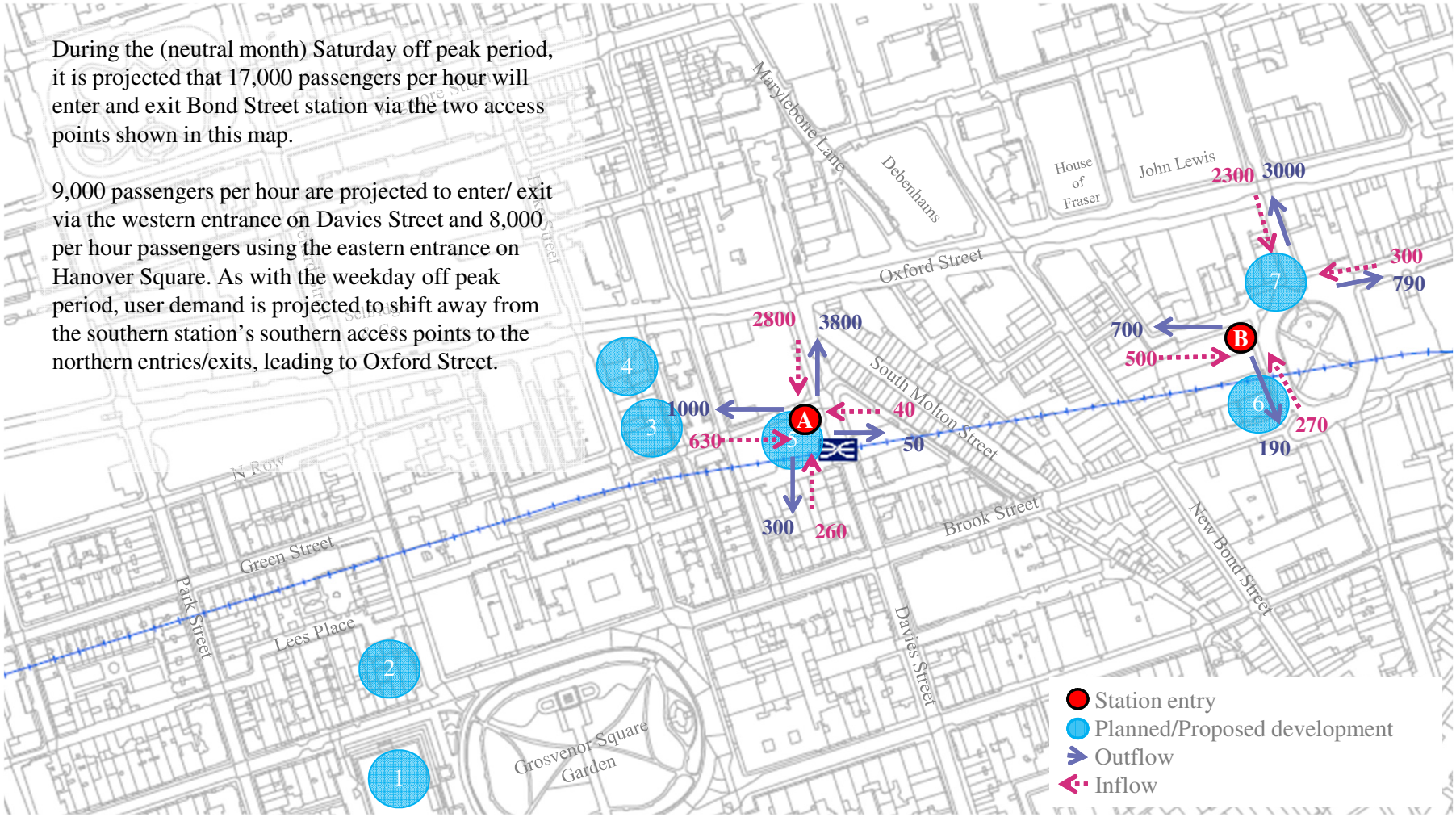
Bond Street

Projected entry and exit counts: September ("neutral month") Saturday, afternoon hour

During the (neutral month) Saturday off peak period, it is projected that 17,000 passengers per hour will enter and exit Bond Street station via the two access points shown in this map.

9,000 passengers per hour are projected to enter/ exit via the western entrance on Davies Street and 8,000 per hour passengers using the eastern entrance on Hanover Square. As with the weekday off peak period, user demand is projected to shift away from the southern station's southern access points to the northern entries/exits, leading to Oxford Street.



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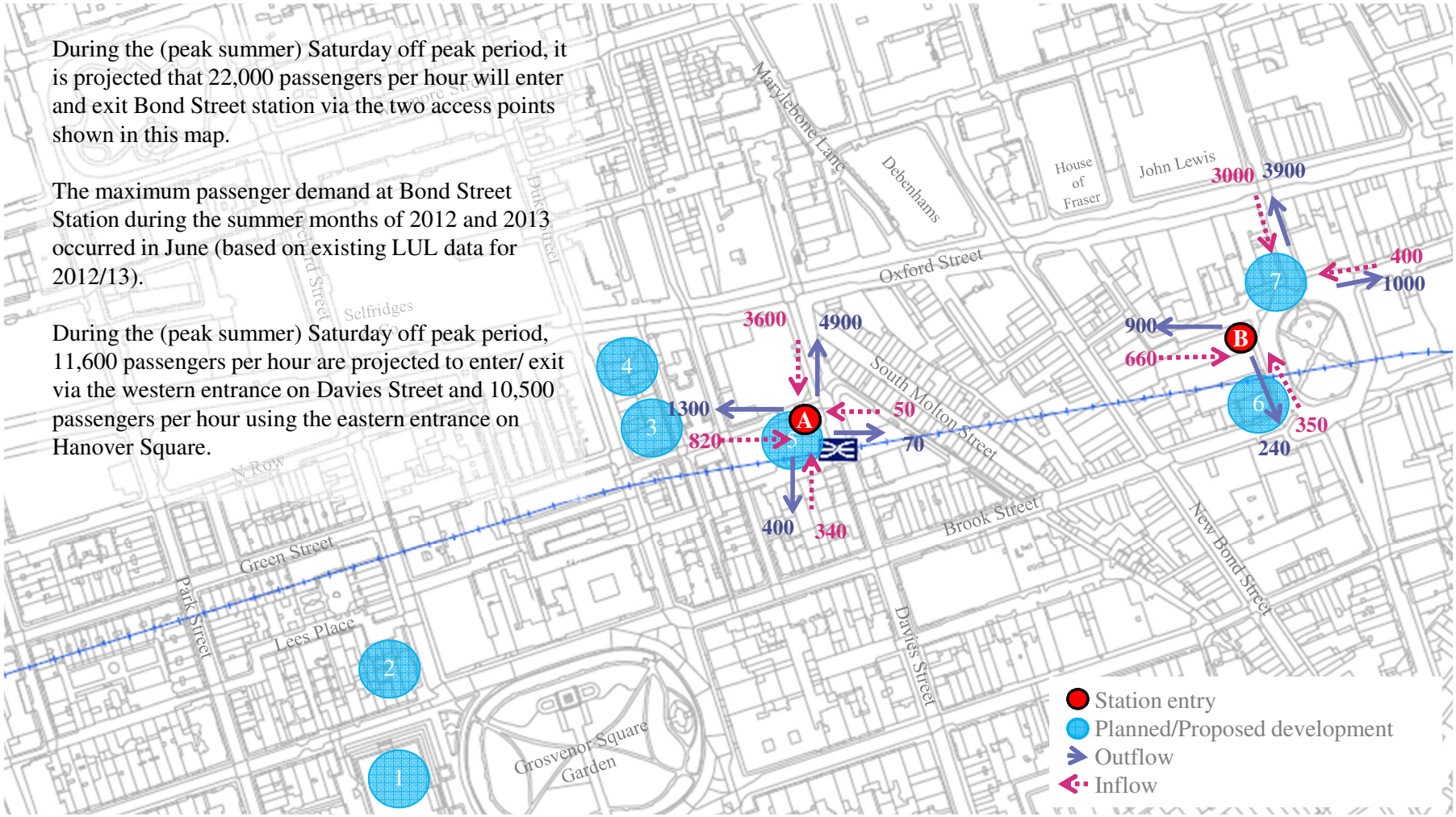
Bond Street

Projected entry and exit counts: Summertime Saturday, afternoon hour

During the (peak summer) Saturday off peak period, it is projected that 22,000 passengers per hour will enter and exit Bond Street station via the two access points shown in this map.

The maximum passenger demand at Bond Street Station during the summer months of 2012 and 2013 occurred in June (based on existing LUL data for 2012/13).

During the (peak summer) Saturday off peak period, 11,600 passengers per hour are projected to enter/ exit via the western entrance on Davies Street and 10,500 passengers per hour using the eastern entrance on Hanover Square.



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Bond Street

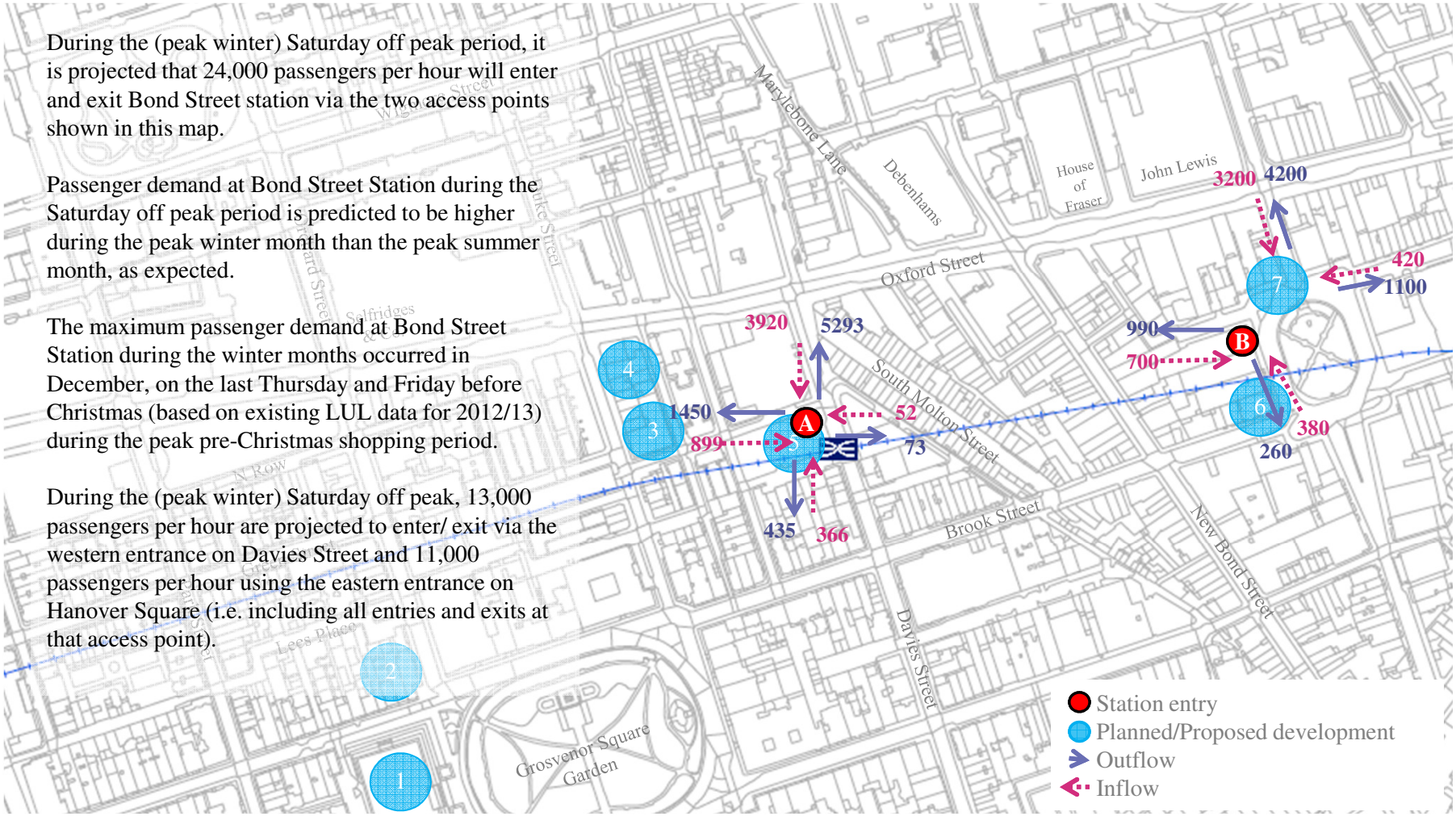
Projected entry and exit counts: Winter Saturday, afternoon hour

During the (peak winter) Saturday off peak period, it is projected that 24,000 passengers per hour will enter and exit Bond Street station via the two access points shown in this map.

Passenger demand at Bond Street Station during the Saturday off peak period is predicted to be higher during the peak winter month than the peak summer month, as expected.

The maximum passenger demand at Bond Street Station during the winter months occurred in December, on the last Thursday and Friday before Christmas (based on existing LUL data for 2012/13) during the peak pre-Christmas shopping period.

During the (peak winter) Saturday off peak, 13,000 passengers per hour are projected to enter/ exit via the western entrance on Davies Street and 11,000 passengers per hour using the eastern entrance on Hanover Square (i.e. including all entries and exits at that access point).



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Tottenham Court Road

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Tottenham Court Road

Introduction

This section presents primary assumptions and analysis of Crossrail visitors projected for Tottenham Court Road station and its vicinity. We have projected visitor entries and exits for each of the station access points according to:

- Time of day (morning and evening peak; off peak);
- Day of week (weekday and weekend day); and
- Season of year (winter and summer).

Station entry and exit counts

On average, up to 306,000 users are projected daily in 2026 at Tottenham Court Road station. Average and seasonal forecasts are presented on the next two pages of this section. We have uplifted current TfL station-level entry and exit counts to project Crossrail demand for the station in 2026, using data from the GLA, TfL and Crossrail. We detail station-by-station TfL data in Appendix C.

Footfall video visitor count data

We have supplemented our understanding of entries and exits by reviewing visitor count data taken by footfall video cameras in the surrounding area. A map of these camera locations is included at Appendix D.

Planned developments in the station vicinity

We have attempted to account for potential changes in entry and exit flows by considering residential and commercial developments planned for the station area. These developments are noted in the maps presented in the following pages, which highlight seasonal and time-of-day changes in station demand projections.

User profiles

Currently available journey purpose data shows only network-wide user profile information for Inner London, Outer London and the capital as a whole. Information is not available on a station-by-station or line-by-line basis. For this reason, we have not sought to draw conclusions from the currently available TfL data. Additional analysis, currently being completed by TfL, could present an opportunity to analyse passenger volumes according to journey purpose.

Tottenham Court Road

Projections: TCR in 2026

The figure, right, compares recent London Underground station entries and exit counts, taken in the first week of September 2013, with entry and exits projected for a similar month in 2026.

September data is useful because it is considered a "neutral" month – one in which demand is unaffected by factors such as seasonal holidays and/or leave. We have based projected neutral month entries and exits upon TfL visitor counts from September 2012 and 2013, noting the effect of the Olympic Games in 2012.

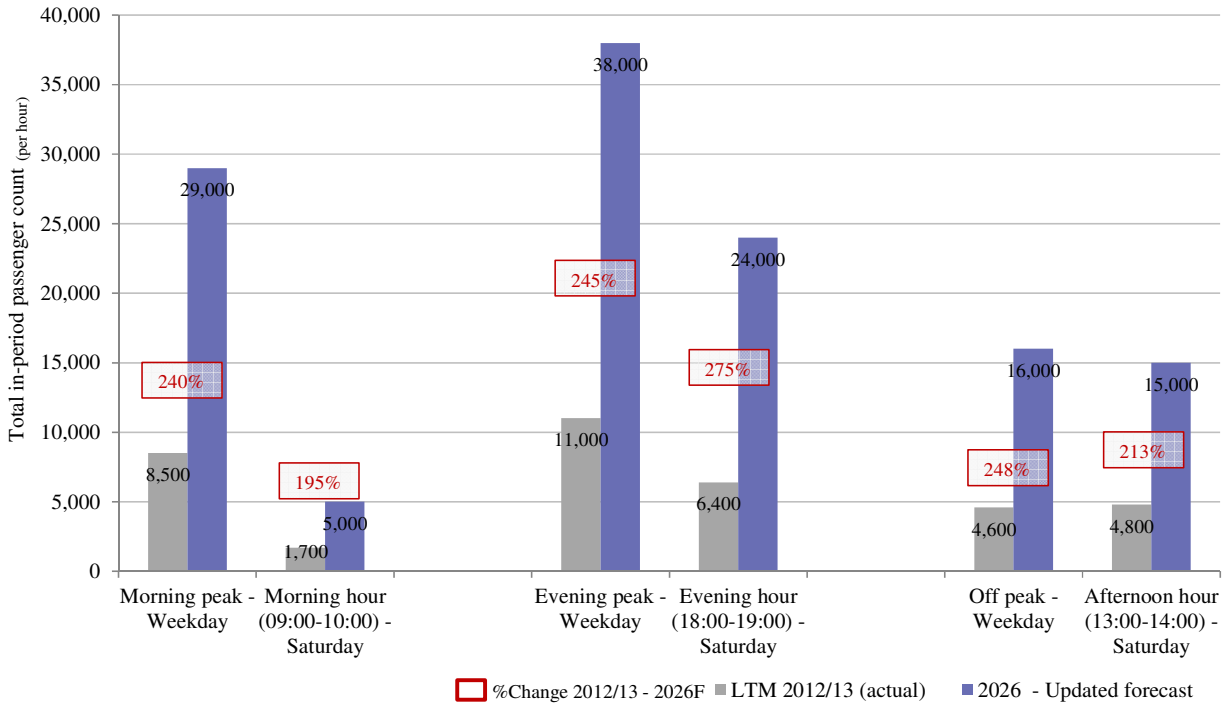


Figure 17: Comparison of visitor entry and/or exit projections in a "neutral" month with September 2013 data. Each bar represents a single hour. The single-hour peak represents an average hour of the three-hour period.

Findings

Crossrail visitor numbers projected for Tottenham Court Road, like Bond Street, are highest during the weekday evening peak, when it is projected some 37,000 people will enter/exit the station. On Saturdays during "neutral" months, forecasts based on most recent population and employment figures project evening peak passenger demand at the station to be some 24,000, declining 40% from the weekday evening peak. This scenario shows that weekend evening peak passenger demand will increase some 250% from current levels.

Projected off-peak passenger demand is comparable on Saturdays and weekdays, during which some 15,000 people will access the station. Unsurprisingly, it is projected that weekend morning passenger demand will be significantly lower than weekday morning demand (83%). Weekday morning peak passenger demand is projected to double at the station in 2026.

ARUP

Tottenham Court Road

User Projections: Seasonal variation in 2026

The figures, right, compare station visitors projected by season. Unlike the visitor count projections shown on the previous page, these forecasts are for periods likely to be affected by seasonal holidays and leave – the summer and winter seasons. The figure on top right shows projected weekday passenger demand. The figure on bottom right shows projected Saturday passenger demand. As before, the numbers shown represent total entries *and* exits.

The basis for these projections is the *maximum* number of entries and exits – rather than the average number, as previously shown – occurring in a given period. Each bar in the tables, left, represents projected demand within a single hour. Appendix C shows data provided by TfL supporting these projections.

It is typically the case that station user numbers are higher in winter months than in summer months. On average, it is projected that winter visitor counts will be some 10% higher than summer visitor counts.

Up to 52,000 people will enter and/or exit Tottenham Court Road station during the winter weekday evening peak.

Changes in off peak demand between seasons and days of the week are minimal when comparing maximum demand.

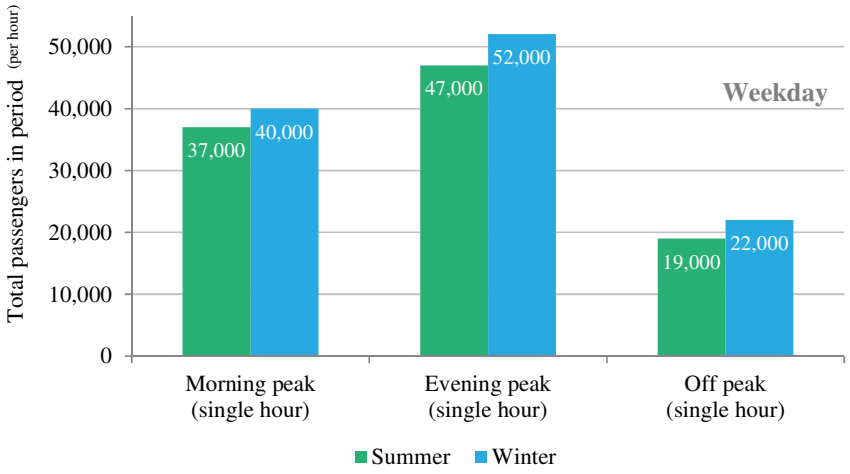


Figure 18: Seasonal comparison of weekday maximum total entries and exits projected within a single hour period. "Peak" represents an average hour of the three-hour peak.

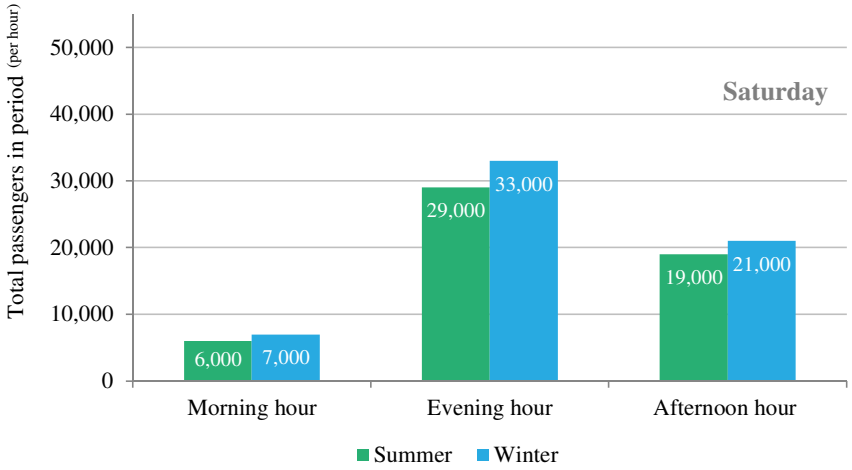


Figure 19: Seasonal comparison of Saturday maximum total entries and exits projected within a single hour period. "Evening" and "afternoon" times as shown on previous page.

ARUP

Tottenham Court Road

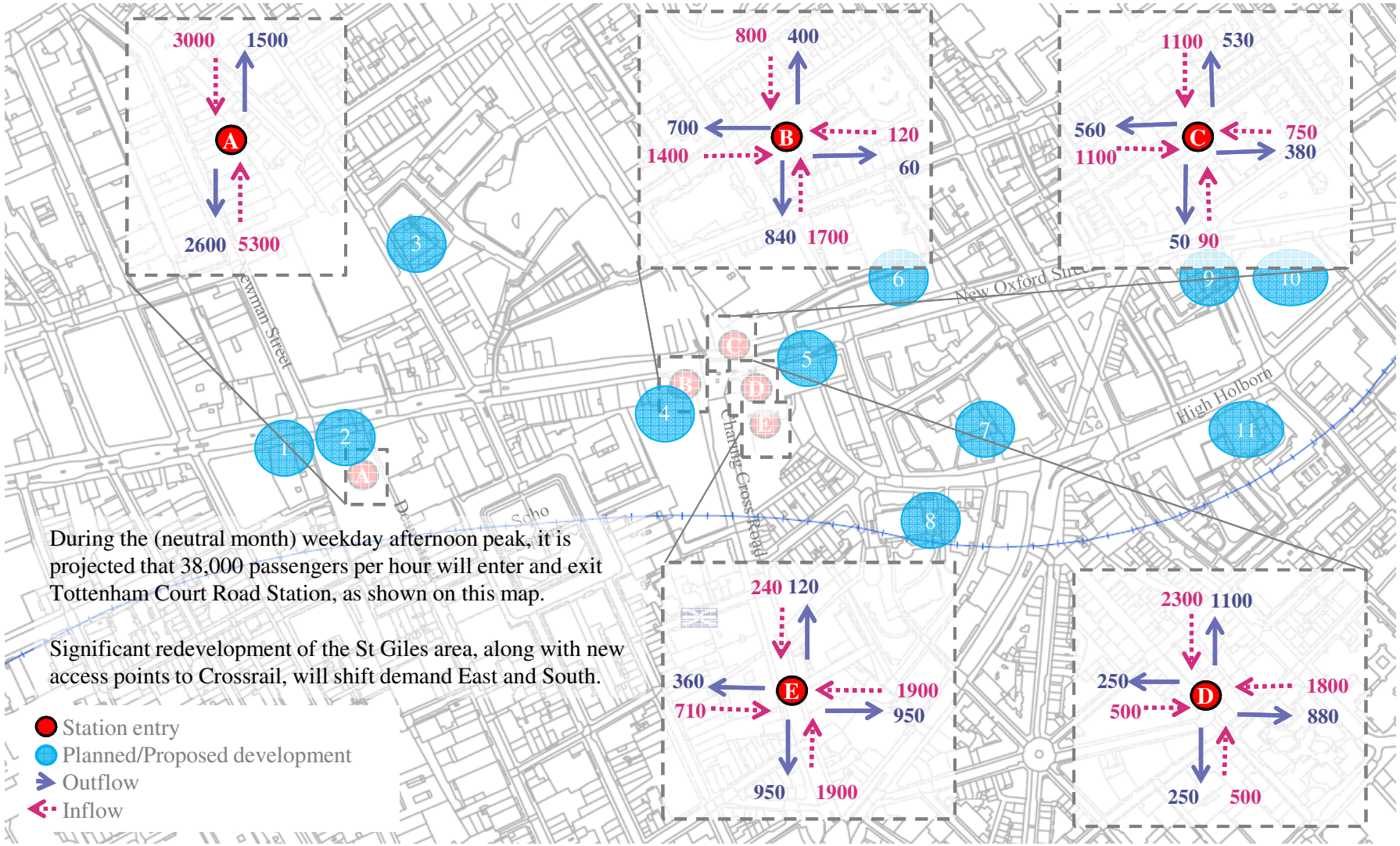
Planned development in the vicinity of the station

Site ID	Building/Site address	Type	Size (square metres)	Unit count	Year expexted
1	Crossrail, development 91-101 Oxford Street	Commercial	46,452 (total)	0	2018
2	Crossrail, development 91-101 Oxford Street	Commercial	46,452 (total)	0	2018
3	Rathbone Place	Mixed use	9,308	180	2019
4	TCR Station	Commercial	1,115	0	2018
5	Centre Point	Mixed use	-	95	2018
6	Prospect House, 80-110 New Oxford Street	Mixed use	-	36	2017
7	St Giles redevelopment	Mixed use	37,000	400	2021
8	St. Giles Church yard and Phoenix Community Gardens	Public space	-	-	2016
9	Former Den Nightclub, New Oxford Street	Commercial	-	-	-
10	The Sorting Office, 21-31 New Oxford Street	Commercial	29,000	-	-
11	Travelodge extension, 174-177 High Holborn	Commercial	-	-	-

Note: Arup analysis of publicly available planning reports and consultancy documents for indicative station exit modelling purposes only; there is some potential for double counting of units between redevelopment areas and individual sites. We have endeavoured to verify these figures with public authorities but no reliance should be placed upon size/unit count or delivery information.

Tottenham Court Road

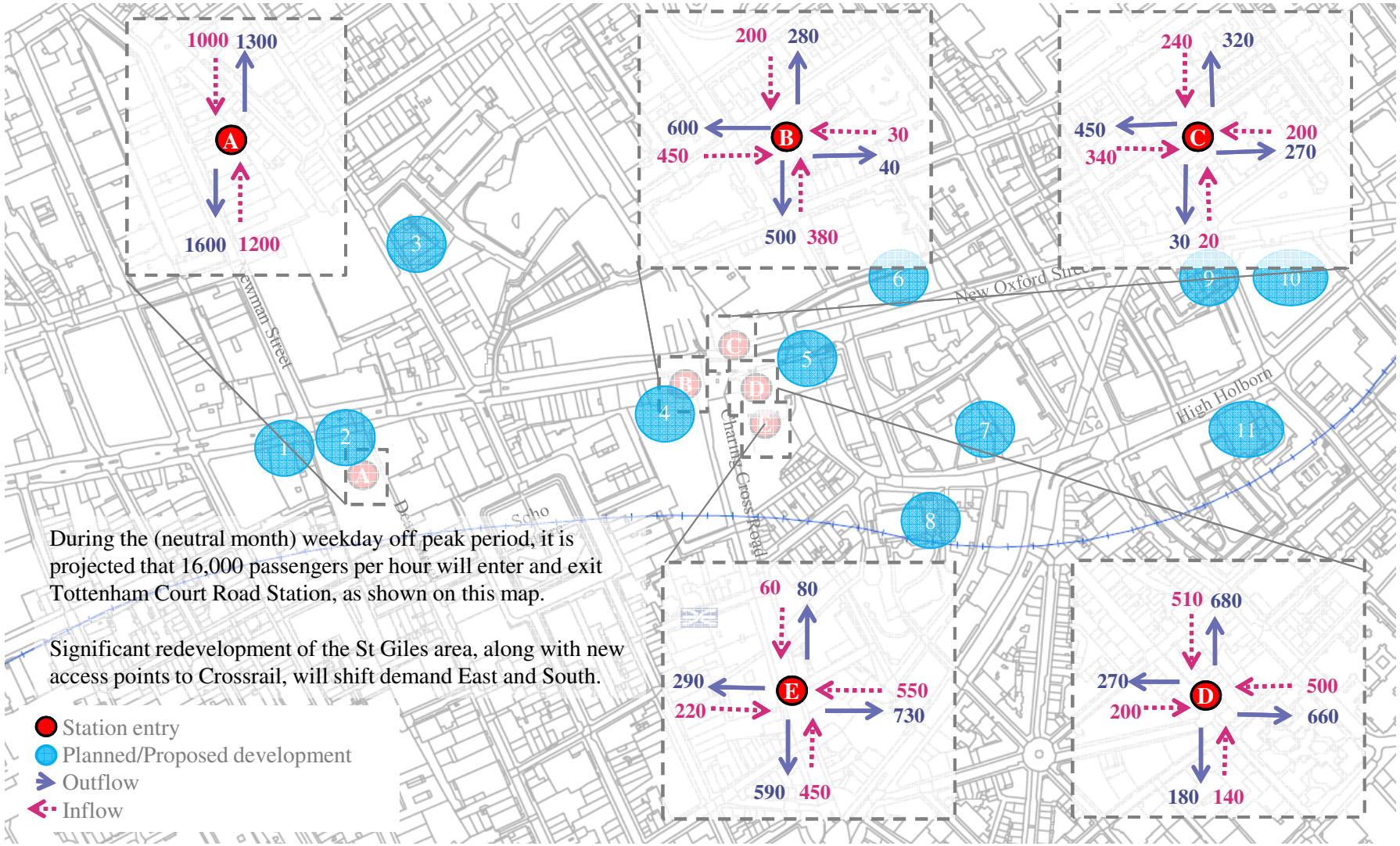
Projected entry and exit counts: September ("neutral month") weekday, afternoon peak



ARUP

Tottenham Court Road

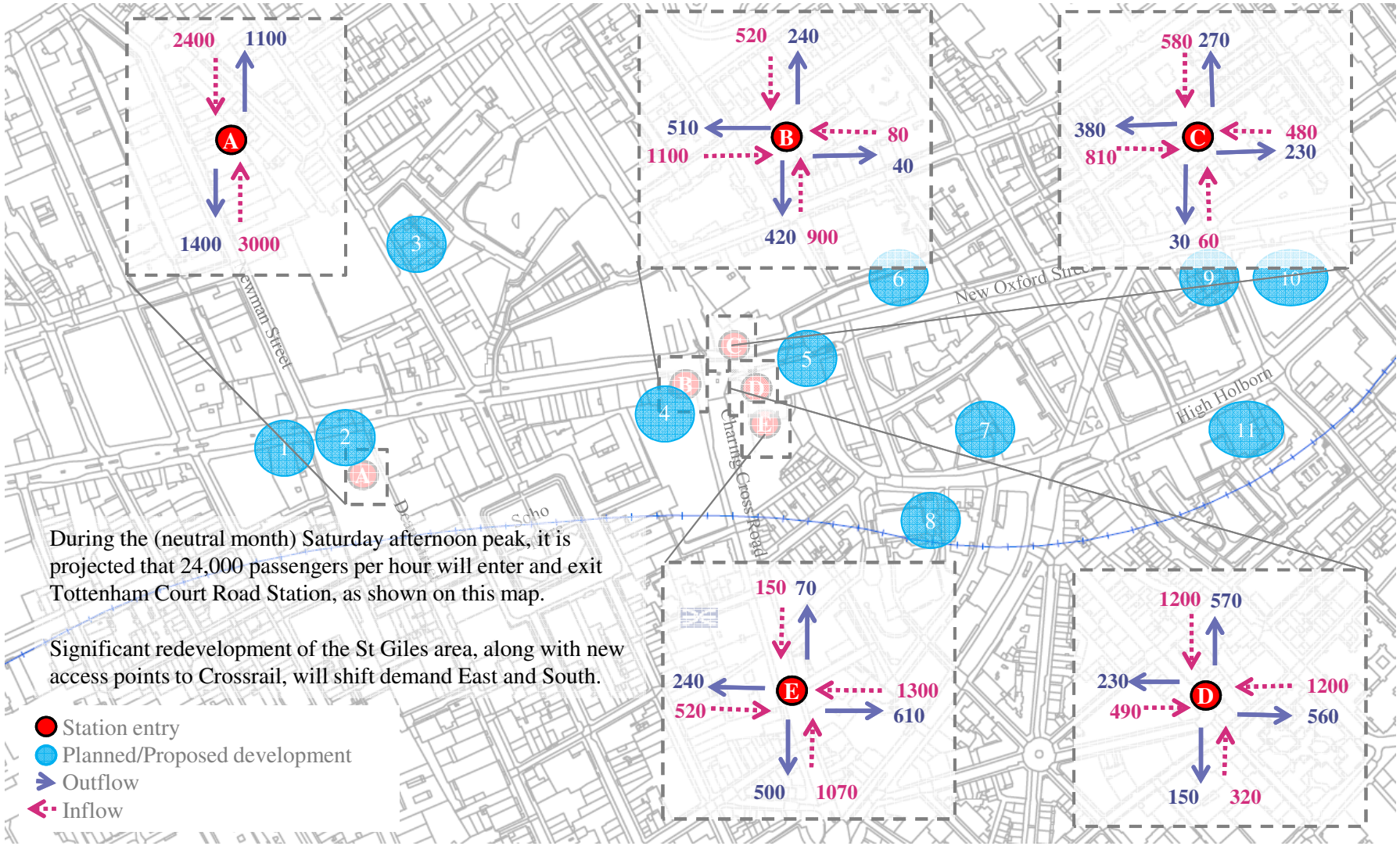
Projected entry and exit counts: September ("neutral month") Weekday, off peak



ARUP

Tottenham Court Road

Projected entry and exit counts: September ("neutral month") Saturday, evening hour



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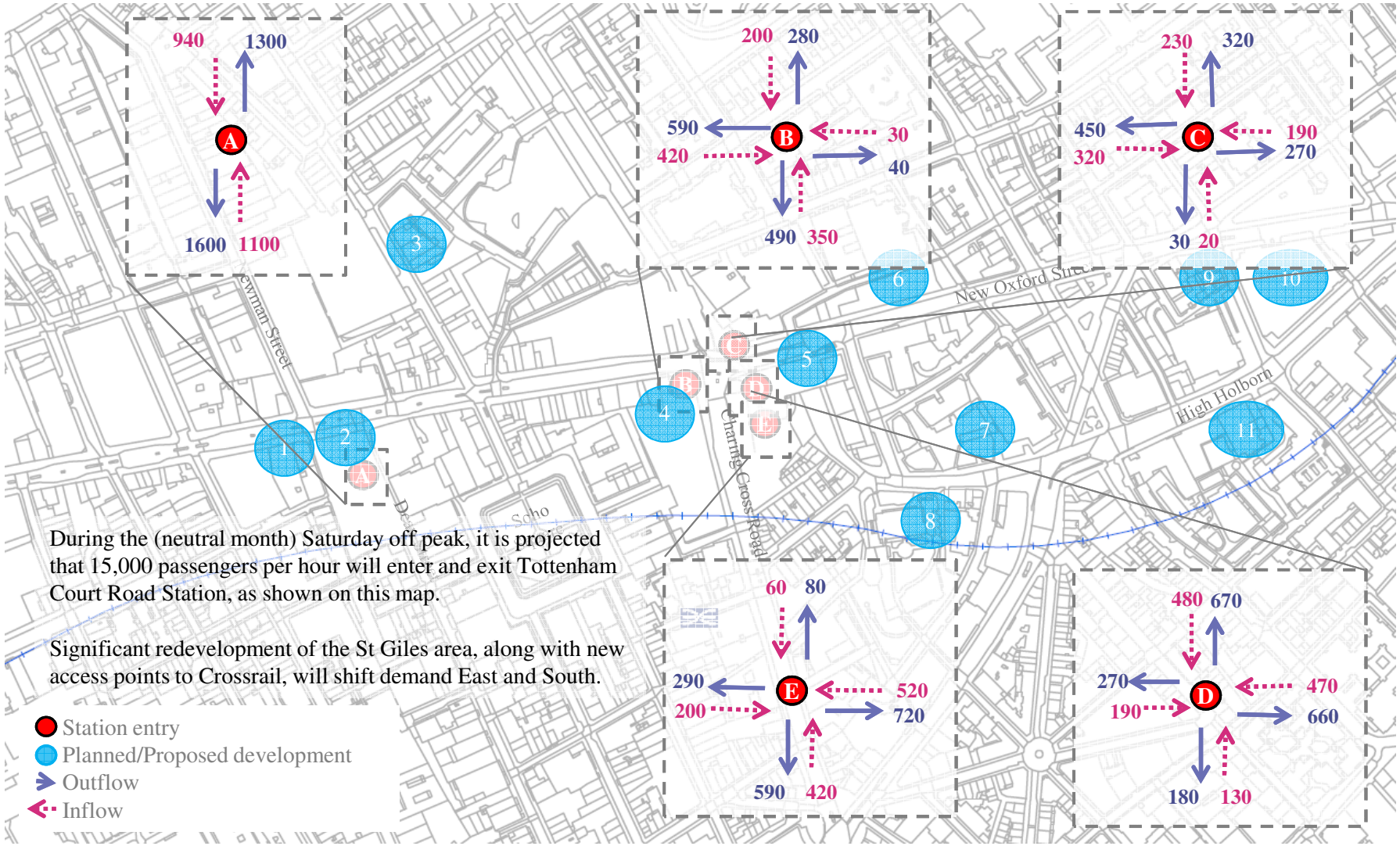
Tottenham Court Road

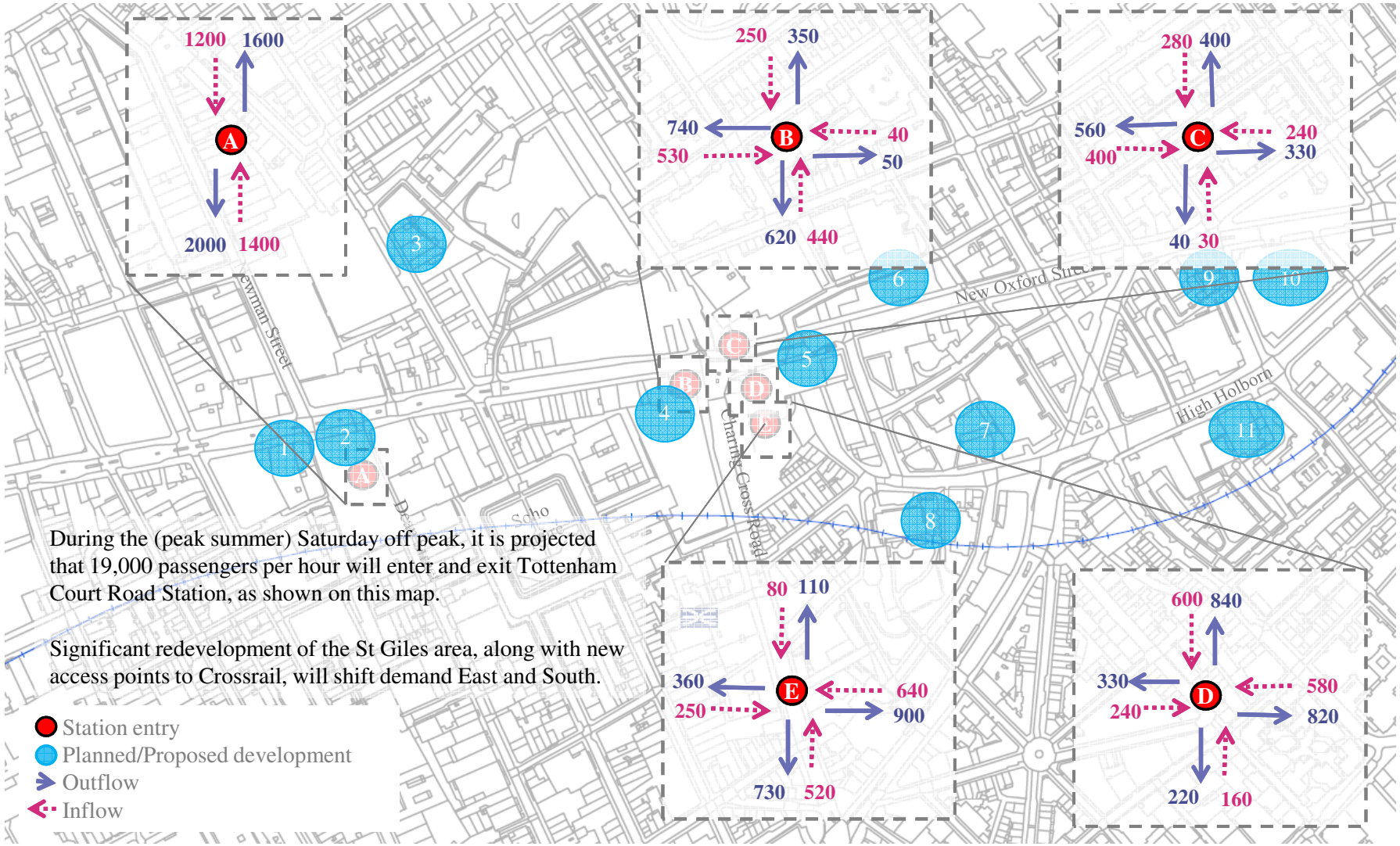
Projected entry and exit counts: September ("neutral month") Saturday, afternoon hour



ARUP

Tottenham Court Road

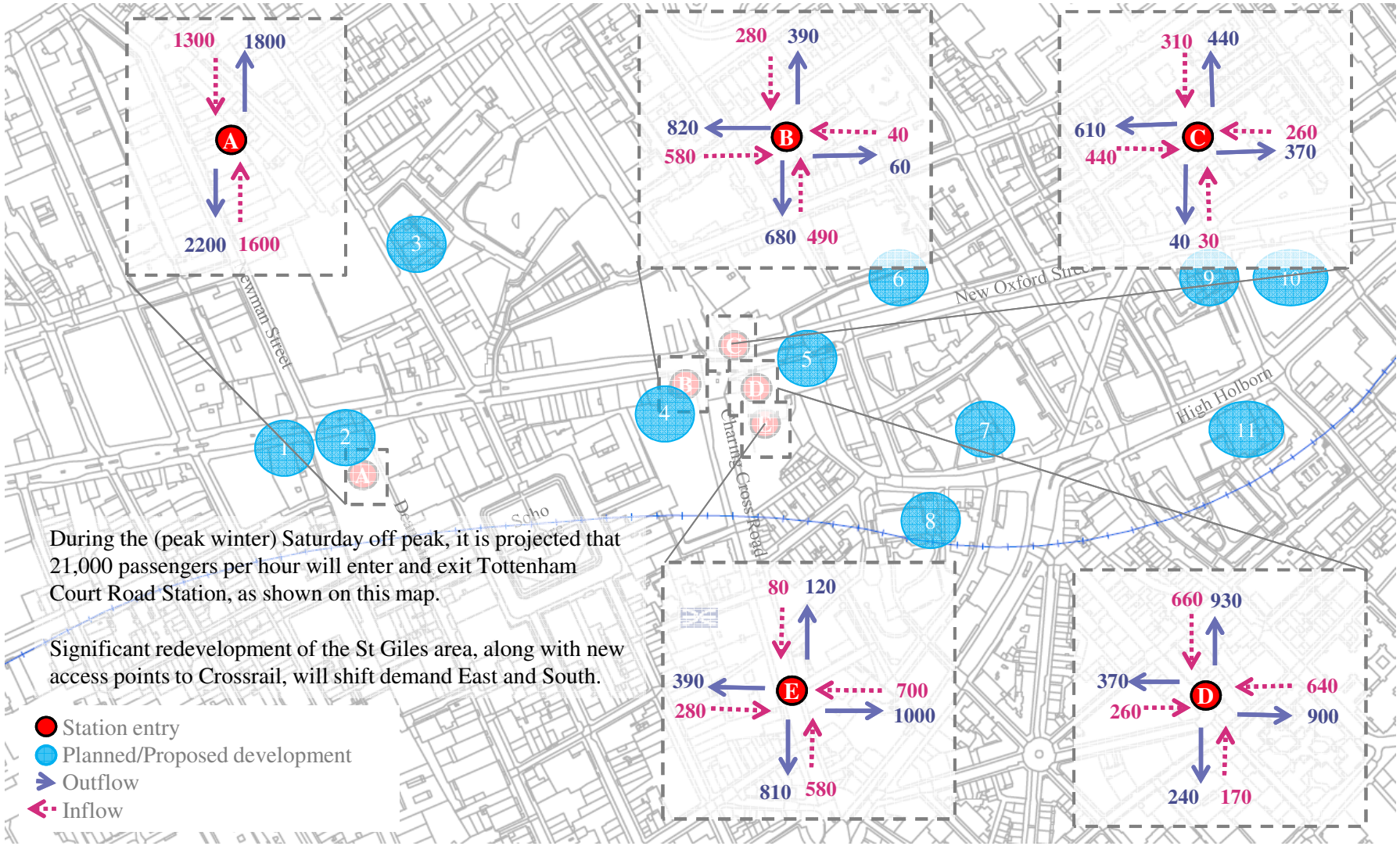
Projected entry and exit counts: Summertime Saturday, afternoon hour



ARUP

Tottenham Court Road

Projected entry and exit counts: Winter Saturday, afternoon hour



ARUP

Farringdon

ARUP

Farringdon

Introduction

This section presents primary assumptions and analysis of Crossrail visitors projected for Farringdon station and its vicinity. We have projected visitor entries and exits for each of the station access points according to:

- Time of day (morning and evening peak; off peak);
- Day of week (weekday and weekend day); and
- Season of year (winter and summer).

Station entry and exit counts

On average, up to 153,000 users are projected daily in 2026 at Farringdon station. Average and seasonal forecasts are presented on the next two pages of this section. We have uplifted current TfL station-level entry and exit counts to project Crossrail demand for the station in 2026, using data from the GLA, TfL and Crossrail. We detail station-by-station TfL data in Appendix C.

Footfall video visitor count data

We have supplemented our understanding of entries and exits by reviewing visitor count data taken by footfall video cameras in the surrounding area. A map of these camera locations is included at Appendix D.

Planned developments in the station vicinity

We have attempted to account for potential changes in entry and exit flows by considering residential and commercial developments planned for the station area. These developments are noted in the maps presented in the following pages, which highlight seasonal and time-of-day changes in station demand projections.

User profiles

Currently available journey purpose data shows only network-wide user profile information for Inner London, Outer London and the capital as a whole. Information is not available on a station-by-station or line-by-line basis. For this reason, we have not sought to draw conclusions from the currently available TfL data. Additional analysis, currently being completed by TfL, could present an opportunity to analyse passenger volumes according to journey purpose.

Farringdon

User Projections: Farringdon in 2026

The figure, right, compares recent London Underground station entries and exit counts, taken in the first week of September 2013, with entry and exits projected for a similar month in 2026.

September data is useful because it is considered a "neutral" month – one in which demand is unaffected by factors such as seasonal holidays and/or leave. We have based projected neutral month entries and exits upon TfL visitor counts from September 2012 and 2013, noting the effect of the Olympic Games in 2012.

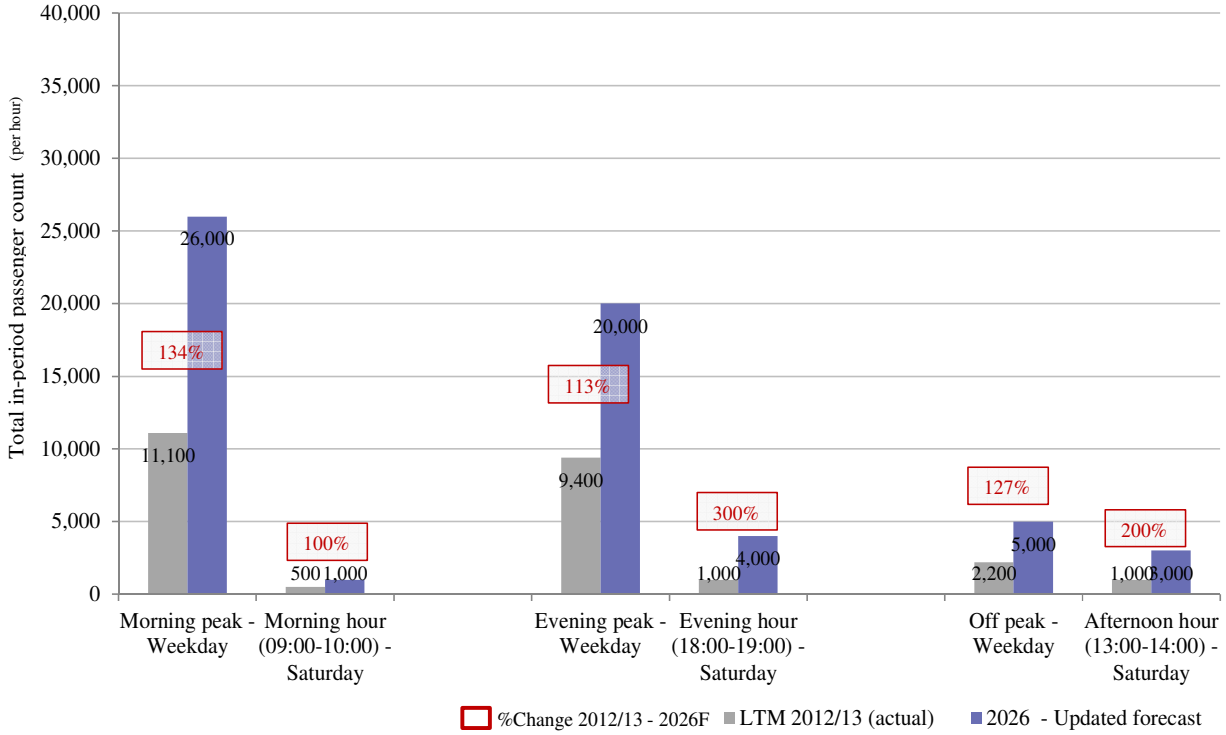


Figure 20: Comparison of visitor entry/exit projections in an "average" month with LTM 2012/13 data. Each bar represents a single hour. The single-hour peak represents an average hour of the three-hour period.

Findings

Crossrail visitor numbers projected for Farringdon, like Bond Street, are highest during the weekday evening peak, when it is projected some 20,000 people will enter/exit the station. On Saturdays during "neutral" months, forecasts based on most recent population and employment figures project evening peak passenger demand at the station to be some 4,000, declining precipitously due to the area's role as an employment centre. This scenario shows that weekend evening peak passenger demand will increase some 250% from current levels.

As would be expected for an employment base, off peak passenger demand similarly decreases on weekends. In the LTM period, 2,200 people visited Farringdon during the weekday off peak period, and 1,000 people during the Saturday peak. Overall, visitor numbers are projected to increase significantly at Farringdon – growth averages 240% across the three periods.

ARUP

Farringdon

User Projections: Seasonal variation in 2026

The figures, right, compare station visitors projected by season. Unlike the visitor count projections shown on the previous page, these forecasts are for periods likely to be affected by seasonal holidays and leave – the summer and winter seasons. The figure on top right shows projected weekday passenger demand. The figure on bottom right shows projected Saturday passenger demand. As before, the numbers shown represent total entries *and* exits.

The basis for these projections is the *maximum* number of entries and exits – rather than the average number, as previously shown – occurring in a given period. Each bar in the tables, left, represents projected demand within a single hour. Appendix C shows data provided by TfL supporting these projections.

It is typically the case that station user numbers are higher in winter months than in summer months. On average, it is projected that winter visitor counts will be some 10% higher than summer visitor counts.

Up to 33,000 people per hour will enter and/or exit Farringdon station during the winter weekday evening peak. This compares with some 6,000 per hour on a Saturday evening.

When comparing maximum demand levels, changes in off peak demand between seasons and days of the week are minimal.

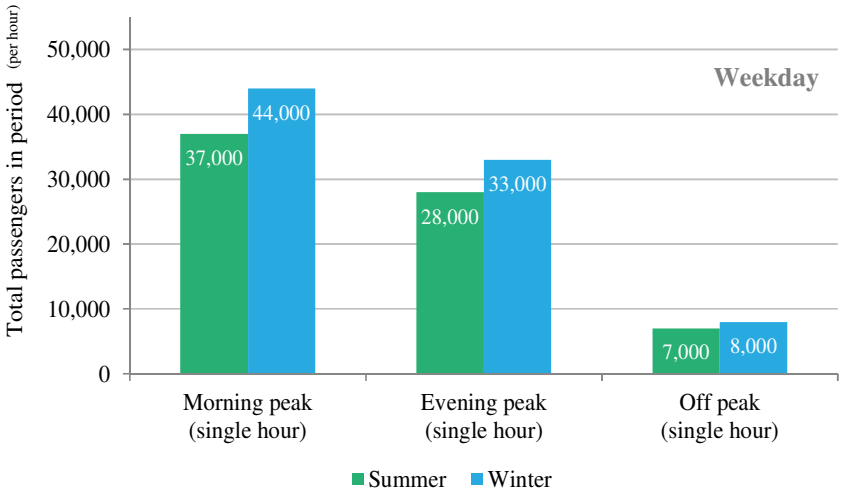


Figure 21: Seasonal comparison of weekday maximum total entries and exits projected within a single hour period. "Peak" represents an average hour of the three-hour peak.

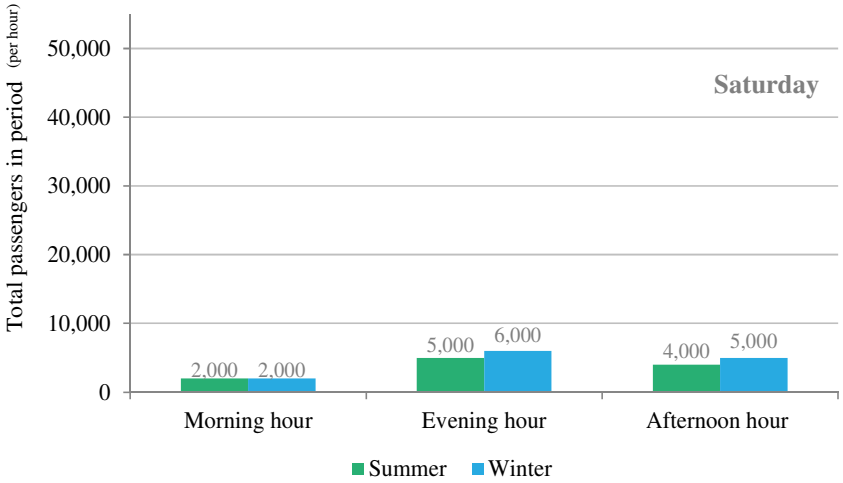


Figure 22: Seasonal comparison of Saturday maximum total entries and exits projected within a single hour period. "Evening" and "afternoon" times as shown on previous page.

ARUP

Farringdon

Planned development in the vicinity of the station

Site ID	Building/Site address	Type	Size (square metres)	Unit count	Year expexted
1	Cowcross Street/Farringdon Road (above western ticket hall)	Commercial	19,231	-	2019
2	Farringdon Station Eastern ticket hall (above hall)	Commercial	11,148	-	2019
3	St Bartholomew's Hospital redevelopment	Medical	No additional space / No use change	-	2016
4	Smithfield Market redevelopment	Mixed use	26,920	-	-

Note: Arup analysis of publicly available planning reports and consultancy documents for indicative station exit modelling purposes only; there is some potential for double counting of units between redevelopment areas and individual sites. We have endeavoured to verify these figures with public authorities but no reliance should be placed upon size/unit count or delivery information.

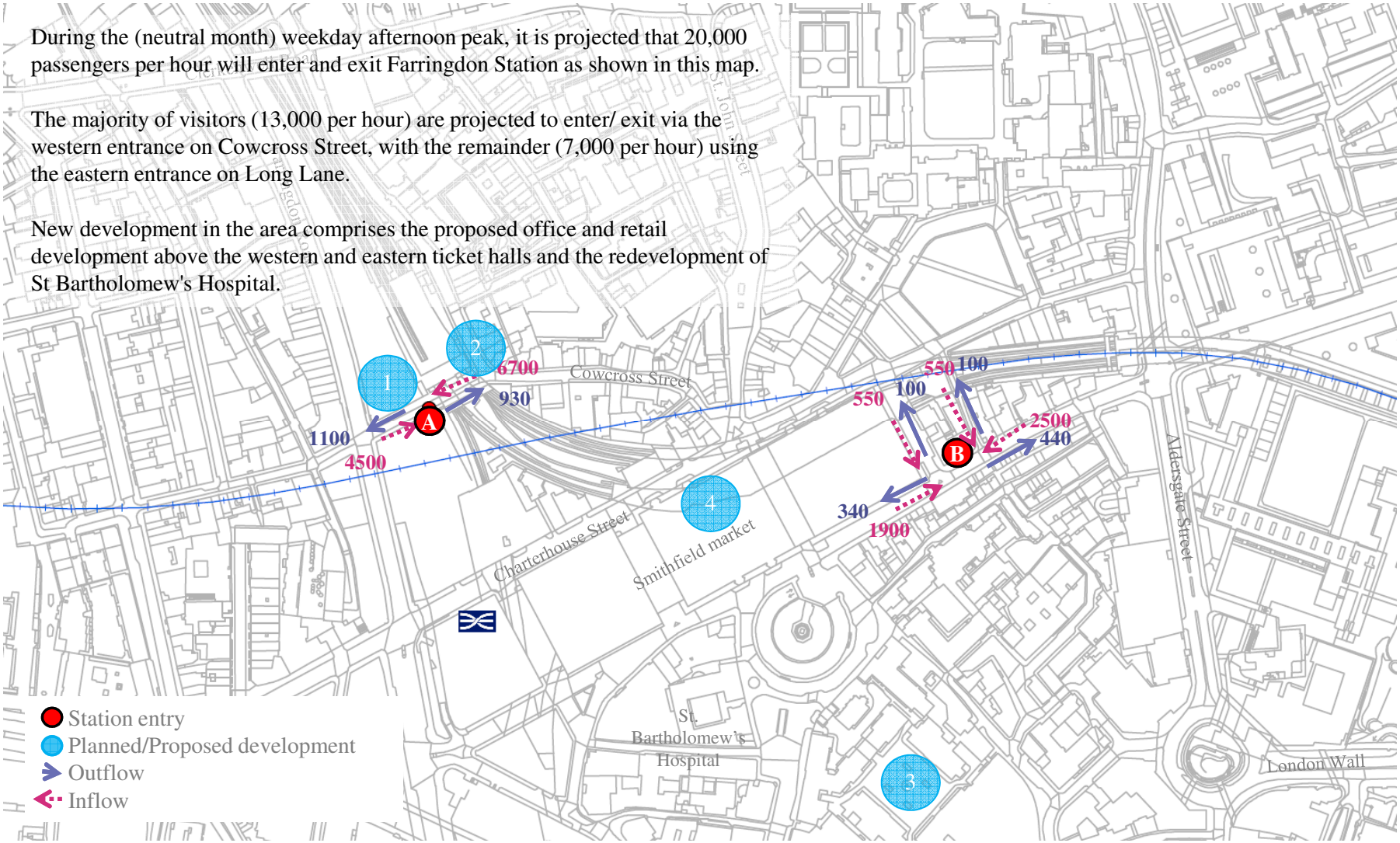
Farringdon

Projected entry and exit counts: September ("neutral month") weekday, afternoon peak

During the (neutral month) weekday afternoon peak, it is projected that 20,000 passengers per hour will enter and exit Farringdon Station as shown in this map.

The majority of visitors (13,000 per hour) are projected to enter/ exit via the western entrance on Cowcross Street, with the remainder (7,000 per hour) using the eastern entrance on Long Lane.

New development in the area comprises the proposed office and retail development above the western and eastern ticket halls and the redevelopment of St Bartholomew's Hospital.



ARUP

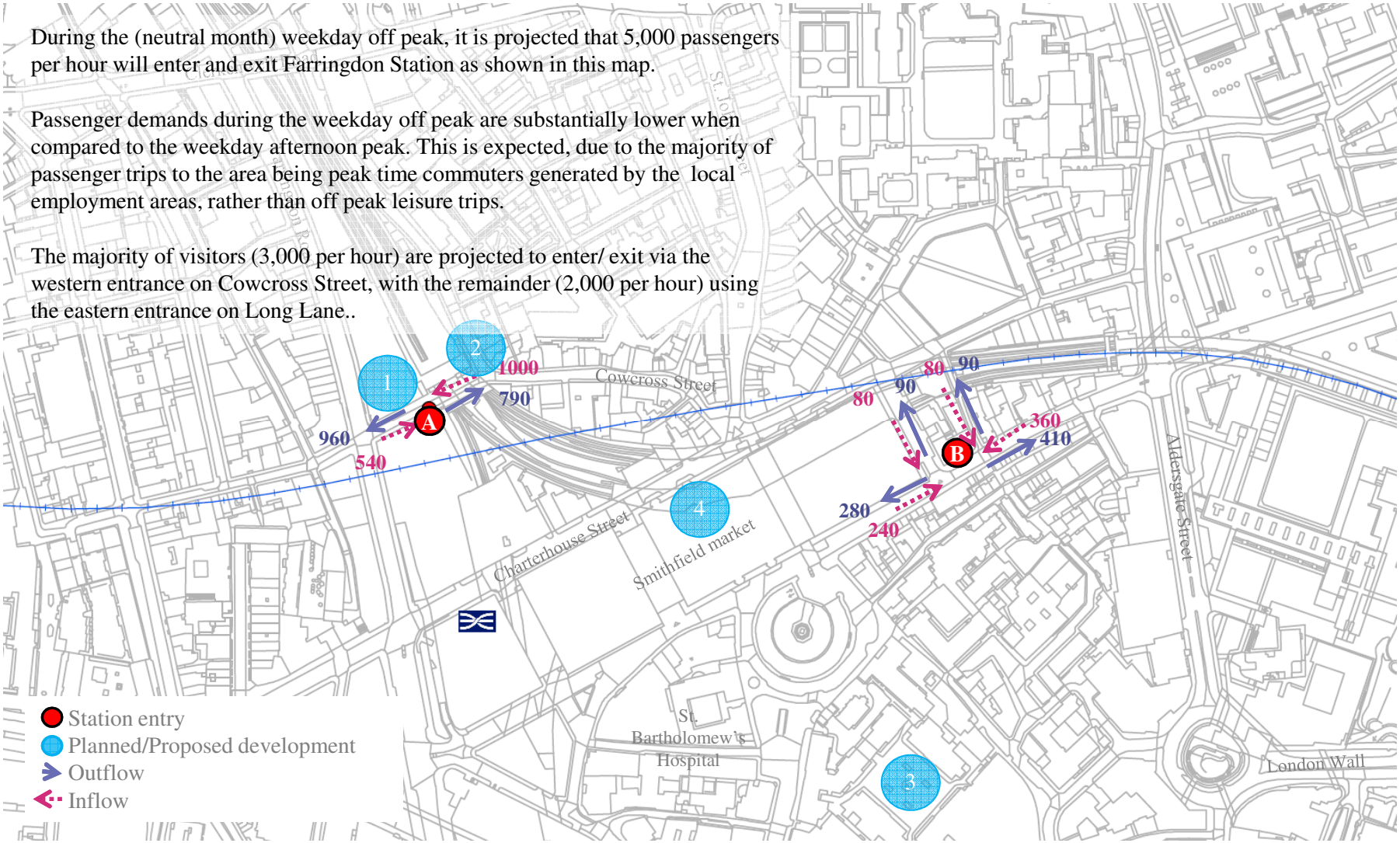
Farringdon

Projected entry and exit counts: September ("neutral month") Weekday, off peak

During the (neutral month) weekday off peak, it is projected that 5,000 passengers per hour will enter and exit Farringdon Station as shown in this map.

Passenger demands during the weekday off peak are substantially lower when compared to the weekday afternoon peak. This is expected, due to the majority of passenger trips to the area being peak time commuters generated by the local employment areas, rather than off peak leisure trips.

The majority of visitors (3,000 per hour) are projected to enter/ exit via the western entrance on Cowcross Street, with the remainder (2,000 per hour) using the eastern entrance on Long Lane..



ARUP

Farringdon

Projected entry and exit counts: September ("neutral month") Saturday, evening hour

During the (neutral month) Saturday afternoon peak, it is projected that 4,000 passengers per hour will enter and exit Farringdon Station as shown in this map.

Passenger demands at Farringdon Station during the Saturday afternoon peak are expected to be relatively low when compared to the weekday as the area is predominantly employment based, attracting mostly weekday peak period commuters.

2,000 passengers per hour are projected to enter/ exit via the western entrance on Cowcross Street, with the remainder using the eastern entrance on Long Lane.

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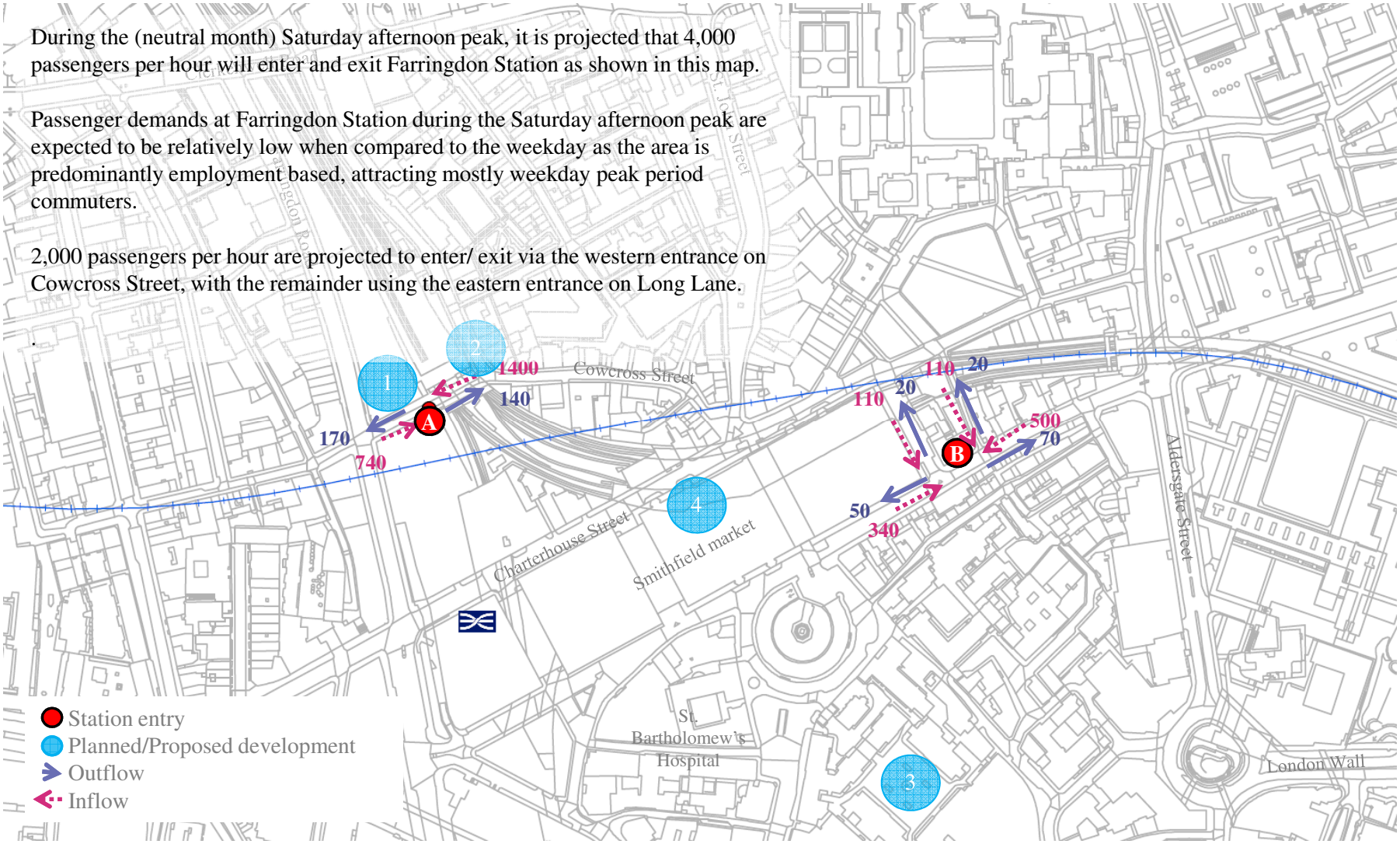

ARUP

Farringdon

Projected entry and exit counts: September ("neutral month") Saturday, afternoon hour

During the (neutral month) Saturday off peak, it is projected that 3,000 passengers per hour will enter and exit Farringdon Station as shown in this map. Passenger demands during the Saturday off peak are lower when compared to the weekday off peak.

The majority of visitors (2,000 per hour) are projected to enter/ exit via the western entrance on Cowcross Street, with the remainder (1,000 per hour) using the eastern entrance on Long Lane.

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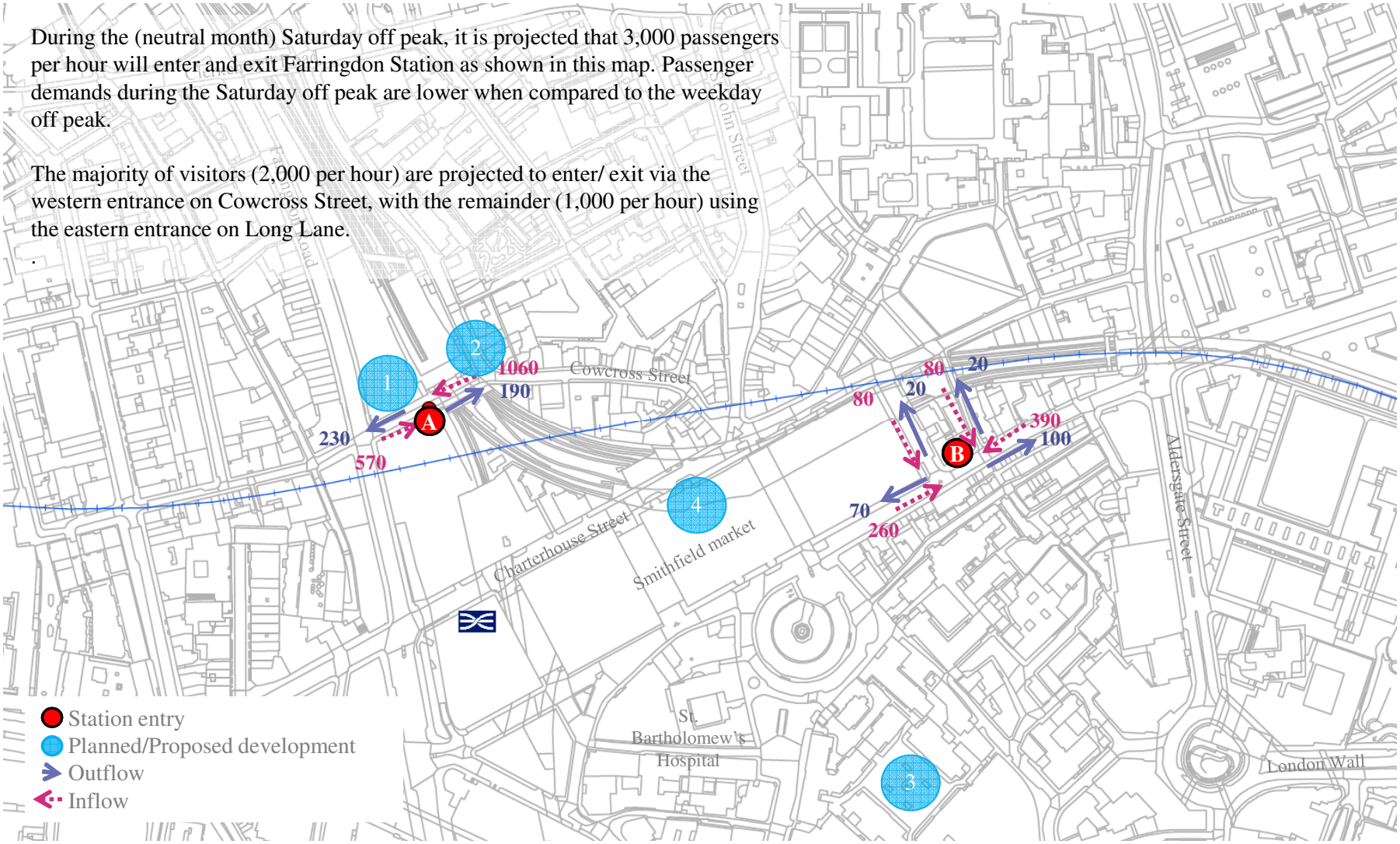

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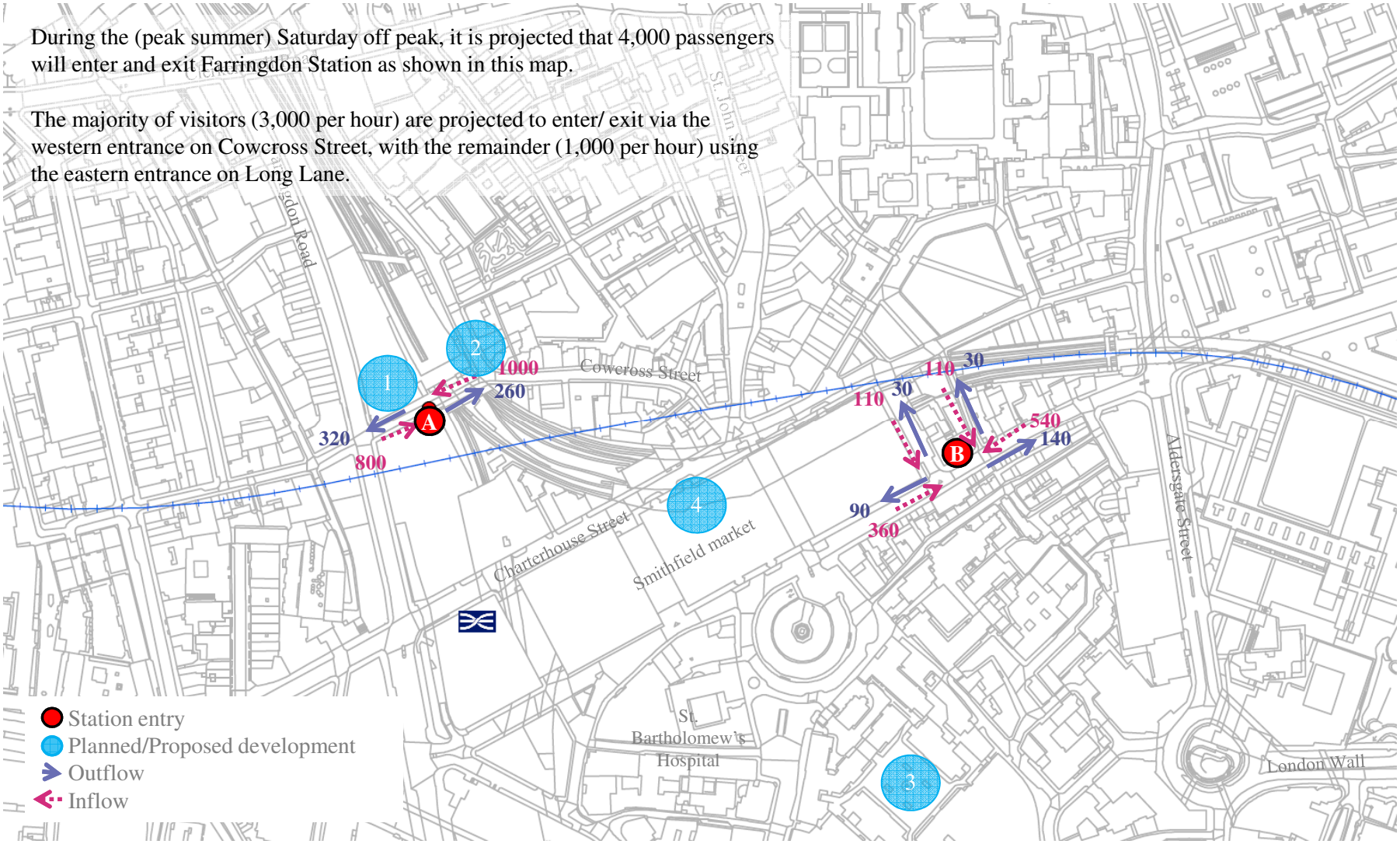
Farringdon

Projected entry and exit counts: Summertime Saturday, afternoon hour

During the (peak summer) Saturday off peak, it is projected that 4,000 passengers will enter and exit Farringdon Station as shown in this map.

The majority of visitors (3,000 per hour) are projected to enter/ exit via the western entrance on Cowcross Street, with the remainder (1,000 per hour) using the eastern entrance on Long Lane.



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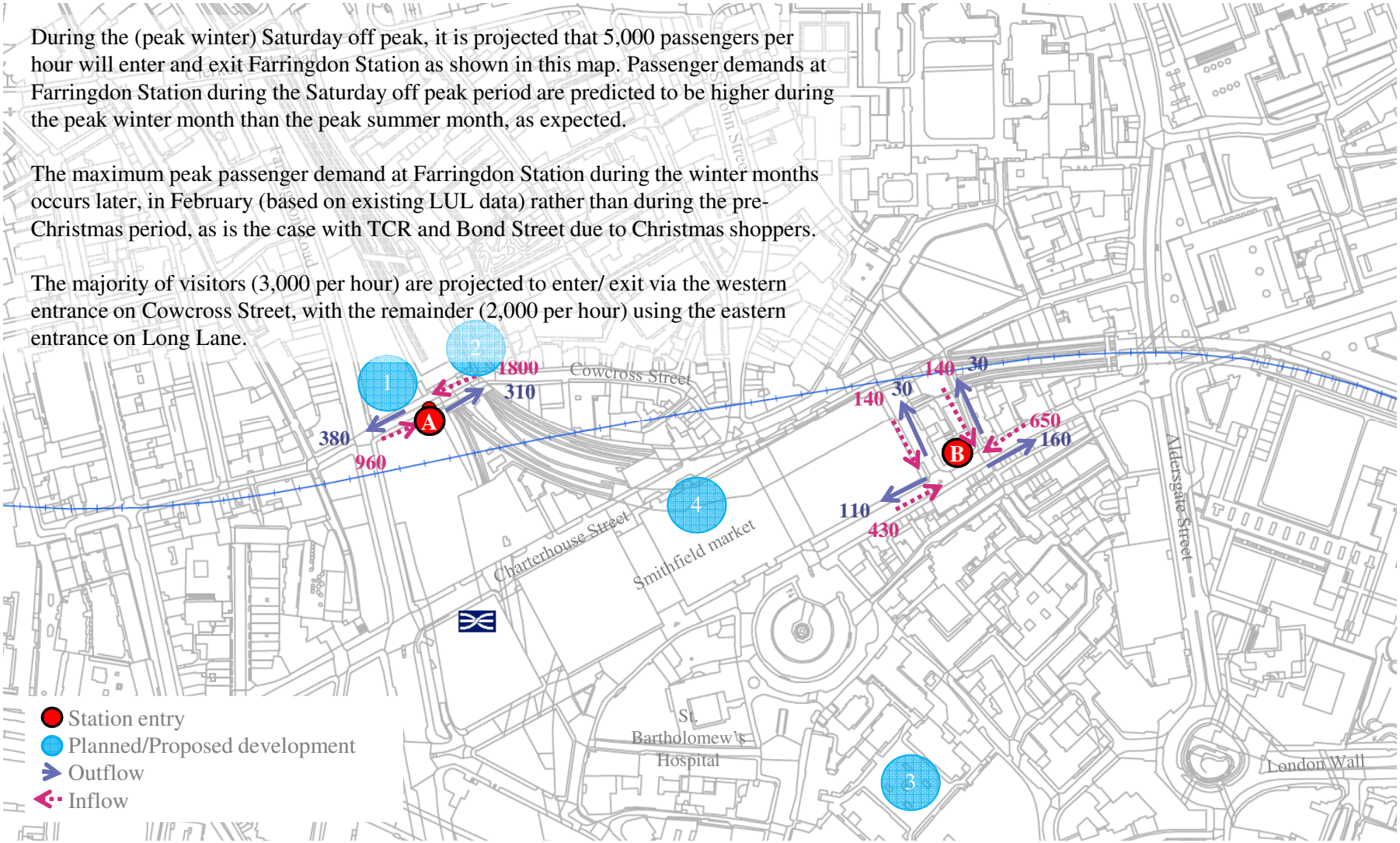
Farringdon

Projected entry and exit counts: Winter Saturday, afternoon hour

During the (peak winter) Saturday off peak, it is projected that 5,000 passengers per hour will enter and exit Farringdon Station as shown in this map. Passenger demands at Farringdon Station during the Saturday off peak period are predicted to be higher during the peak winter month than the peak summer month, as expected.

The maximum peak passenger demand at Farringdon Station during the winter months occurs later, in February (based on existing LUL data) rather than during the pre-Christmas period, as is the case with TCR and Bond Street due to Christmas shoppers.

The majority of visitors (3,000 per hour) are projected to enter/ exit via the western entrance on Cowcross Street, with the remainder (2,000 per hour) using the eastern entrance on Long Lane.



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Appendices

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Appendix A

Outline

The analysis associated with the Crossrail Visitor Study has two main objectives:

- Explore the impact of macro population and employment factors on published Crossrail demand
- Indicate the relevant visitor demand issues outside of peak commuting trips

The analysis did not seek to review the published Crossrail demand figures and this analysis does not supersede any analysis already undertaken, particularly that presented by Crossrail and Transport for London (TfL). Instead it responds to the request for a greater understanding of the impacts of Crossrail on businesses and especially developers and retailers in the vicinity of Bond Street, Tottenham Court Road and Farringdon Crossrail stations. The estimates take 2026 as a forecast year and represents an estimate of all trips to and from the respective station.

The analysis takes as a starting point the base data provided in the Crossrail Bill Environmental Statement, Volume 8 and subsequently in Transport Assessments, Urban Design Studies and Station Access Studies. Arup is very grateful for the assistance provided by Crossrail and TfL in obtaining access to reports and data.

Analyses pivot off the base data to provide the following set of indicators:

- The impact of faster London Plan growth (delivering Crossrail demand growth earlier);
- Average daily and annual demand;
- Weekday off peak hour demand;
- Saturday and Sunday busy hour demand;
- Seasonal peak demand (summer and winter);
- Segmentation of trips by user profile based on trip purpose;
- Distribution of trips to areas around each station based on destination.

These are intended to supplement the analysis undertaken by Crossrail and TfL to provide greater information to interested stakeholders. The following section describes the data flow and assumptions underlying the analysis, indicating the source of supporting data where relevant.

Analysis method and assumptions

Macro Factors

Analysis of macro projections for population and employment growth will drive faster than anticipated growth in travel demand on Crossrail. This means only that the demand used to determine station and service capacity on Crossrail will be achieved sooner than originally forecast, not that the forecasts and design are incorrect.

This impact has been experienced on other recent major transport projects in London such as the Docklands Light Railway, London Overground and domestic High Speed line services to Kent. London Plan and population growth data from the Greater London Authority (GLA) were used to factor up demand estimates prepared using earlier, lower population projections.

Appendix A

Method and assumptions *(continued)*

Three growth scenarios were compared against the original Crossrail Bill forecasts, each population estimate driving a different set of Crossrail demand estimates:

- Crossrail Bill – relates to a forecasted 2026 population of 8.65 million
- Crossrail Transport Assessment – 2026 population of 8.78 million (2% extra growth)
- 2010 London Plan Growth – 2026 population of 9.42 million (9% extra growth)
- 2012 London Plan Update – 2026 population of 9.64 million (11% extra growth)

Using these headline populations to scale travel demand a series of factored analyses were undertaken, as follows.

Workstream 1 – average weekday and annual demand

Entry and Exit counts for each existing London Underground station were used to produce factors to convert from AM and PM peak period Crossrail demand forecasts to average weekday estimates, based on TfL hourly counts for September 2013. These factors differ markedly between stations. Farringdon, which is dominated by commuter flows has a very "peaky" profile, whereas the spread of demand at Bond Street is more even over the day.

e.g. Factor to convert from PM Peak Period Entries to Average Weekday Entries at Farringdon = 1.926, and at Bond Street = 2.504

These daily figures were adjusted to annual average demand based on ticket gateline data from TfL for August 2012 to September 2013. It should be noted that this period of data will have been affected by the visitors attending the Olympic/Paralympic Games.

Workstream 2 – weekday off peak demand

TfL Entry and Exit counts for each existing London Underground station were also used to produce factors to convert from AM and PM peak period Crossrail demand forecasts to off peak hour estimates. This assumes that the demand profile of passengers across the weekday remains the same in future years. Data were sourced from TfL hourly counts for September 2013.

e.g. Factor to convert from Weekday PM Peak Period to Off Peak Hour at Tottenham Court Road = 0.12

Workstream 3 – Saturday and Sunday busy hour demand

TfL Entry and Exit counts for each existing London Underground station were used to produce factors to convert from AM and PM peak period Crossrail demand forecasts to all day Weekday, Saturday or Sunday estimates and subsequently to Saturday and Sunday busy hour estimates. This assumes that the relative volumes of passengers across the week remain the same in future years. Data were sourced from TfL hourly counts for September 2013.

e.g. Factor to convert from Average Weekday to Sunday at Bond Street = 0.515

Workstream 4 – Seasonal average and busiest day demand

As the base data for entry and exit flow represents a "neutral" month of September (i.e. outside of school or public holiday periods) it is necessary to consider seasonal peaks in demand, both as average daily demand in summer and winter months and for peak daily

Workstream 4 *(continued)*

demand at times of high activity such as before Christmas. Annual ticket gateline data from TfL for August 2012 to September 2013 were used to factor up from an average September weekday to an average summer and winter weekday, and also to a maximum weekday flow (for Bond Street and Tottenham Court Road this peak occurred in late November/early December consistent with the pre-Christmas shopping period).

e.g. Factor to convert from Average Weekday Daily Demand to Peak Summer Weekday at Farringdon = 1.445

Workstream 5 – Segmentation of demand by trip purpose

TfL provides data on journey purpose for the overall travel market in Central London, which has been studied to establish the proportion of passengers travelling for shopping or leisure at different times of the day. TfL is currently analysing these data at a station by station level, which will be used to refine our initial estimates of segmentation by trip purpose. Total hourly demand flows (in any time period) were factored by the proportion of trips travelling for shopping or leisure in that hour based on TfL Travel Demand Survey data. Note that this is a particularly interesting part of the analysis for the businesses and developers in the West End as it has a direct relationship to footfall. Consequently we would view the use of the Central London data rather than station specific data as a key constraint in the analysis to date.

e.g. Factor to convert Off Peak Hour to Off Peak Shopping and Personal Business = 0.65

Workstream 6 – Distribution of pedestrian flow based on destination

Crossrail undertook design studies in order to inform the development of areas immediately around the station entrances to cope with extra pedestrian activity. These studies took into account which entrance/exit passengers would use based on their ultimate origin/destination and also which direction they would walk once outside of the Crossrail station (Design and Access Studies, 2007 and Station Entrances Pedestrian Studies 2011. Allowances were also made for onward mode of travel (including bus, taxi, private car and cycle) as well as walking, although it is unclear how reliable these mode shares would be in the future. This analysis was undertaken for peak periods only, with the dominance of commuting journeys influencing the direction of onward travel. Each total station entry and exit (gateline) flow was split by proportion to relevant station entrances/exits and from there split further by direction of onward travel. The proportion of trips travelling onward by each mode was also recorded.

e.g. Factor to convert from total Bond Street station exit (gateline) to Hanover Square entrance/exit = 0.43
Factor to convert Hanover Square total exit demand to northbound walking route (to/from Oxford Street = 0.71

Appendix A

Snapshot of factors applied to base data in order to arrive at demand projections

BOND STREET STATION															
FLOW INPUTS:			**FACTORS:**												
Total Station Flow (pax)				**AVERAGE MONTH SCENARIO**											
In	45414			**Hybrid**			**Update 2010**			**Latest 2012**			**Stretch (10mn)**		
Out	23453		**AM Peak**	Weekday	Saturday	Sunday	Weekday	Saturday	Sunday	Weekday	Saturday	Sunday	Weekday	Saturday	Sunday
			Factor to 2026	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
2026 Daily			Factor to Forecast Scenario	1.0	1.0	1.0	1.1	1.1	1.1	1.2	1.2	1.2	1.2	1.2	1.2
In	113725		Factor to AM Peak Hour (IN)	3%	2%	2%	3%	2%	2%	3%	2%	2%	3%	2%	2%
Out	127725		Factor to AM Peak Hour (OUT)	76%	23%	18%	76%	23%	18%	76%	23%	18%	76%	23%	18%
Total	241449		Factor to Day of Week	1.0	0.8	0.5	1.0	0.8	0.5	1.0	0.8	0.5	1.0	0.8	0.5
Annual	86.2	million	Factor to Summer month	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
			PM Peak												
2026 Daily (No Crossrail)			Factor to 2026	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
In	75323		Factor to Forecast Scenario	1.0	1.0	1.0	1.1	1.1	1.1	1.2	1.2	1.2	1.2	1.2	1.2
Out	76607		Factor to PM Peak Hour (IN)	42%	35%	41%	42%	35%	41%	42%	35%	41%	42%	35%	41%
Total	151930		Factor to PM Peak Hour (OUT)	39%	40%	47%	39%	40%	47%	39%	40%	47%	39%	40%	47%
Annual	54.2	million	Factor to Day of Week	1.0	0.8	0.5	1.0	0.8	0.5	1.0	0.8	0.5	1.0	0.8	0.5
			Factor to Summer month	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
2012 LUL			**Off Peak**												
In	48538		Factor to 2026	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Out	49366		Factor to Forecast Scenario	1.0	1.0	1.0	1.1	1.1	1.1	1.2	1.2	1.2	1.2	1.2	1.2
Total	97904		Factor to Off Peak Hour (IN)	12%	16%	15%	12%	16%	15%	12%	16%	15%	12%	16%	15%
Annual	34.9	million	Factor to Off Peak Hour (OUT)	35%	42%	67%	35%	42%	67%	35%	42%	67%	35%	42%	67%
			Factor to Day of Week	1.0	0.8	0.5	1.0	0.8	0.5	1.0	0.8	0.5	1.0	0.8	0.5
			Factor to Summer month	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0

Appendix B

Selected sources of information

The following is a list of the data sources to be used to inform the study:

- Logit-based assessments of likely use of station accesses (2006)
- Farringdon Station Transport Assessment (2006) (awaiting information for Bond Street and TCR)
- Design and Access Statements - Further guidance for Bond Street and TCR (2007)
- Revised Station Demand Forecasts Method Note (2010)
- Bond Street Stage C+/D report – urban integration study (2010)
- Bond Street Station Entrances Pedestrian Study (2011)
- Design Framework Farringdon Station Urban Integration Design (2011)
- TCR Station Urban Realm Design Stage C+/D Report (2011)

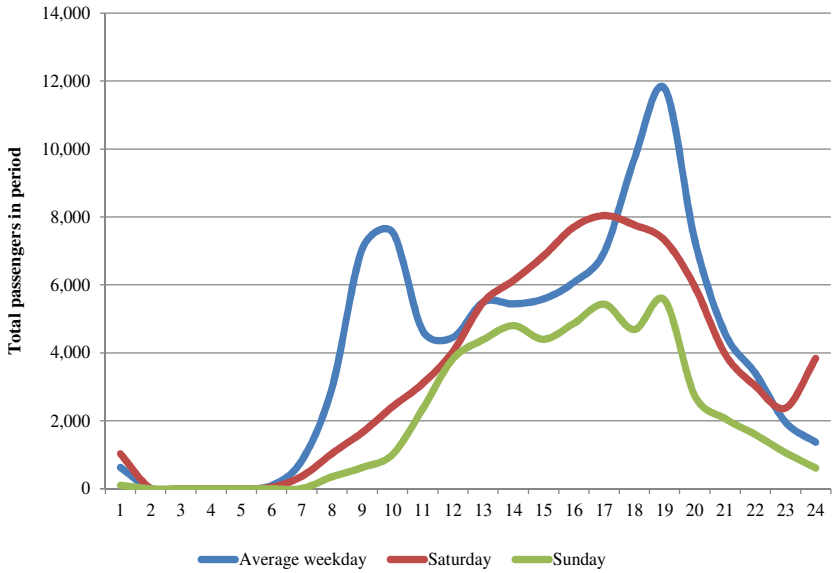
Supplementary Data:

- GVA report – Evaluating Future Retail Opportunities in the St Giles Area (2012).
- Inmidtown report – Retailing in Midtown
- GVA – London West End footfall results.
- CBRE - London's West End – Five Steps to Sustain the World's Top Shopping Streets (2012)

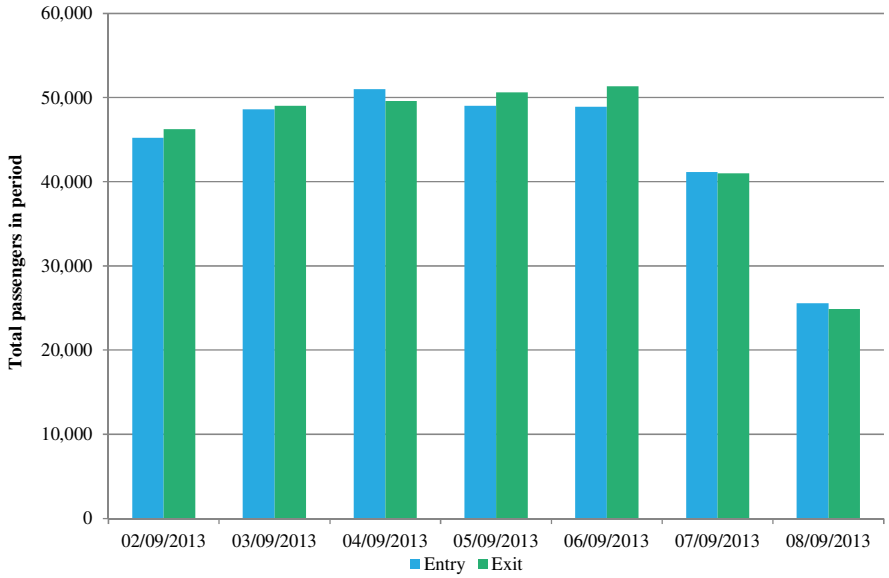
Appendix C

Transport for London data

The figures below show a selection of the data received from TfL underpinning our station-by-station analysis, as referenced in station-specific sections of this report.



Bond Street – Total Hourly Flows (two-way, September 2013)



Bond Street – Total daily flows (September 2013)

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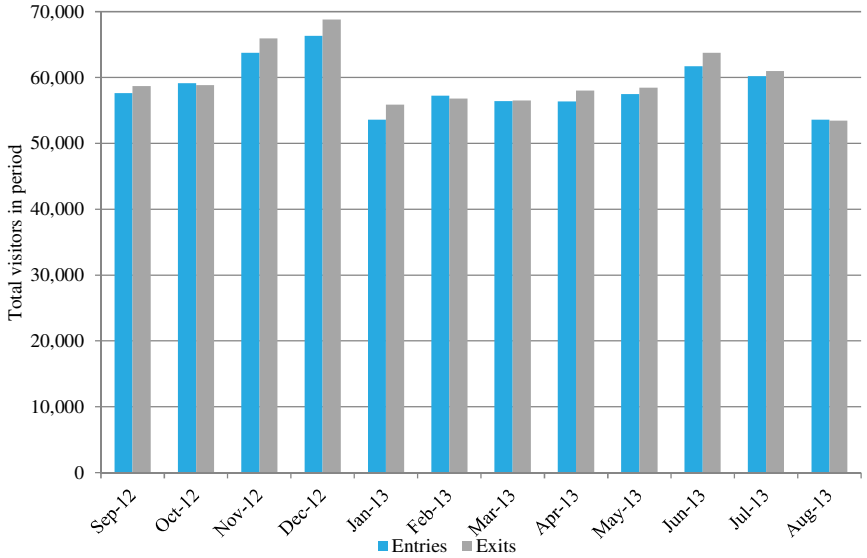
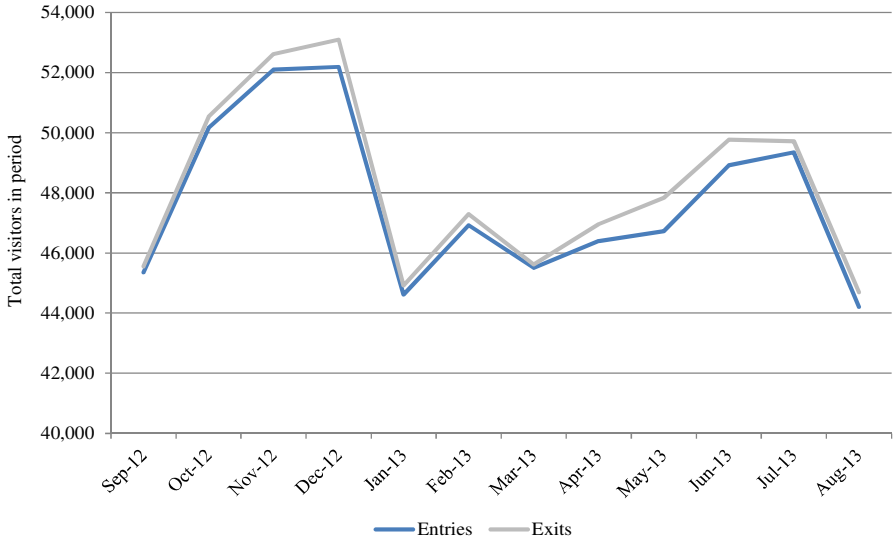


Bond Street – Maximum gate flows per month



Bond Street – Average gate flows per month

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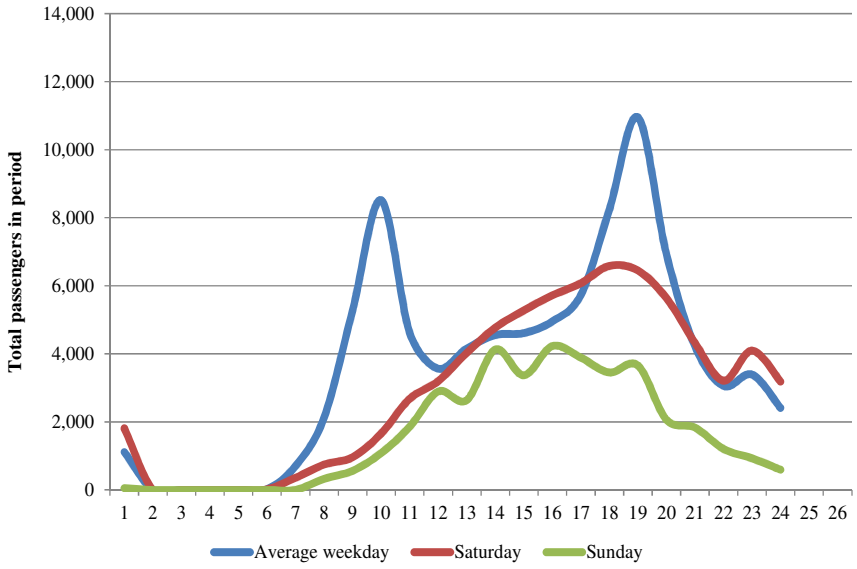
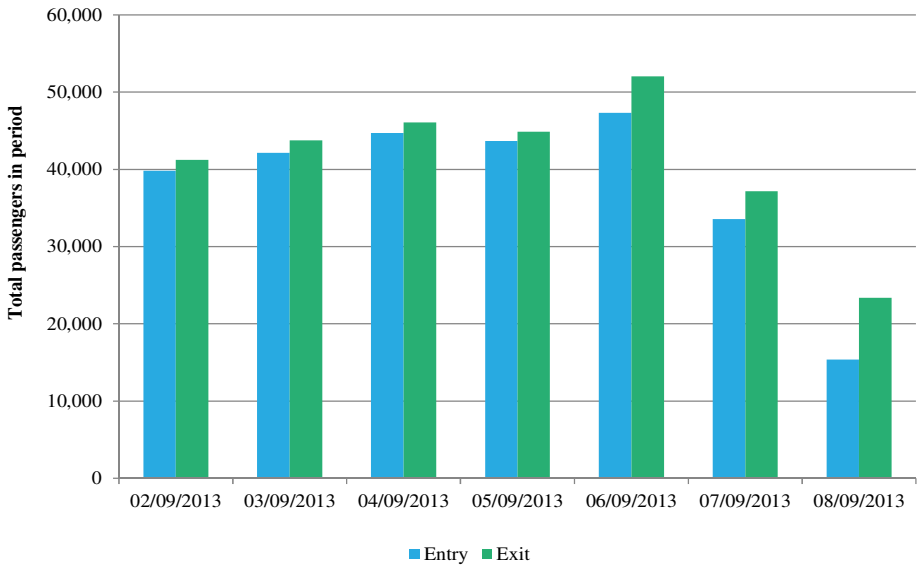


Tottenham Court Road – Total Hourly Flows (two-way, September 2013)



Tottenham Court Road – Total daily flows (September 2013)

ARUP

Appendix C

Transport for London data

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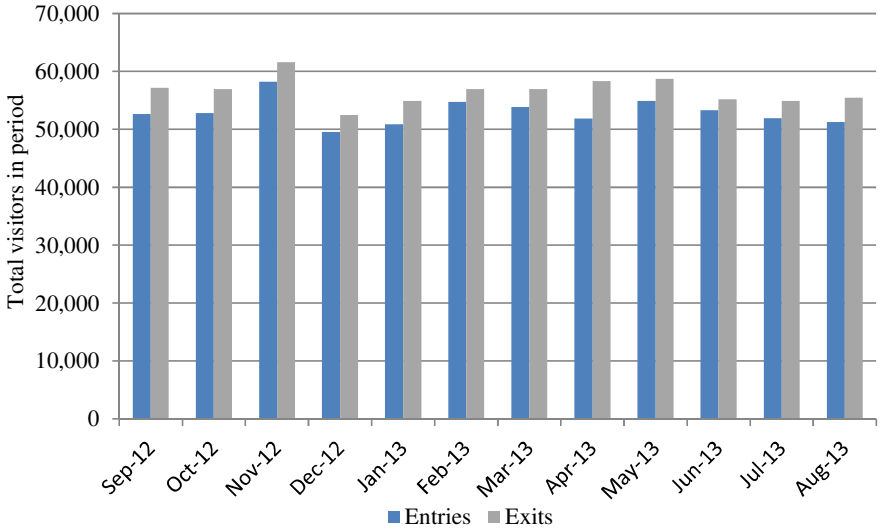
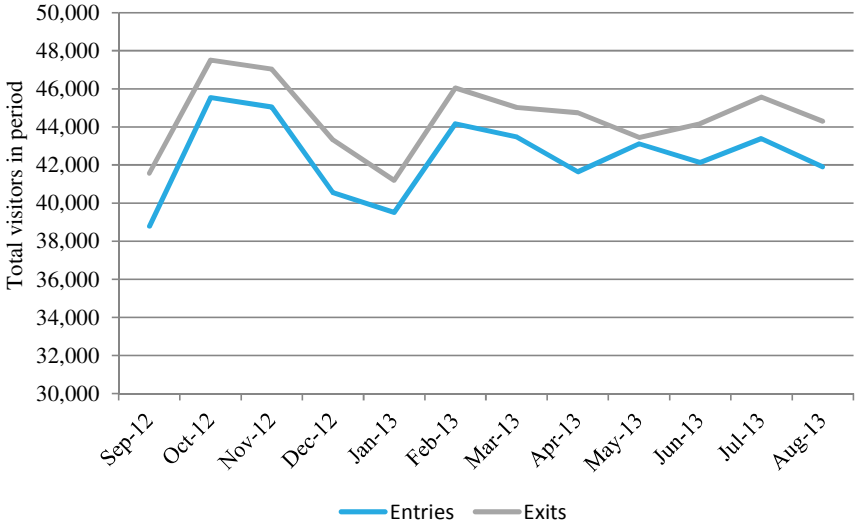


Tottenham Court Road – Maximum gate flows per month



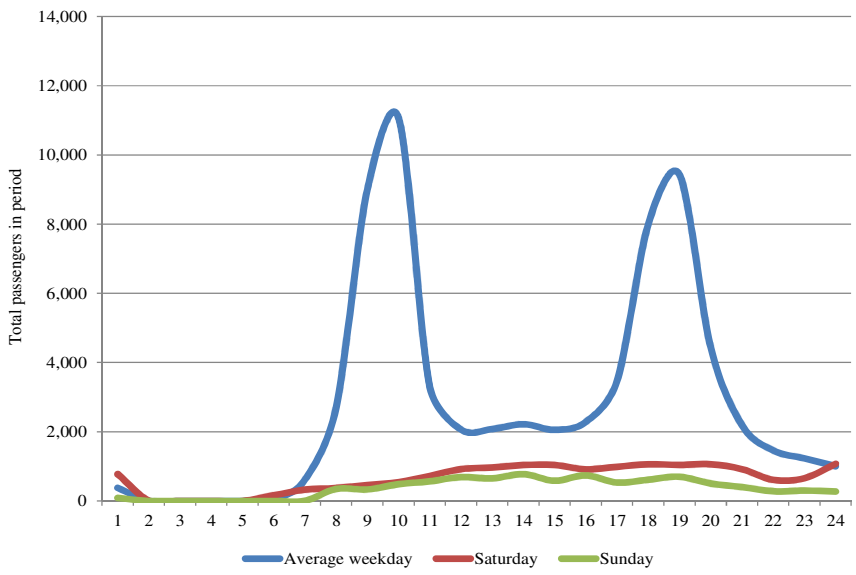
Tottenham Court Road – Average gate flows per month

ARUP

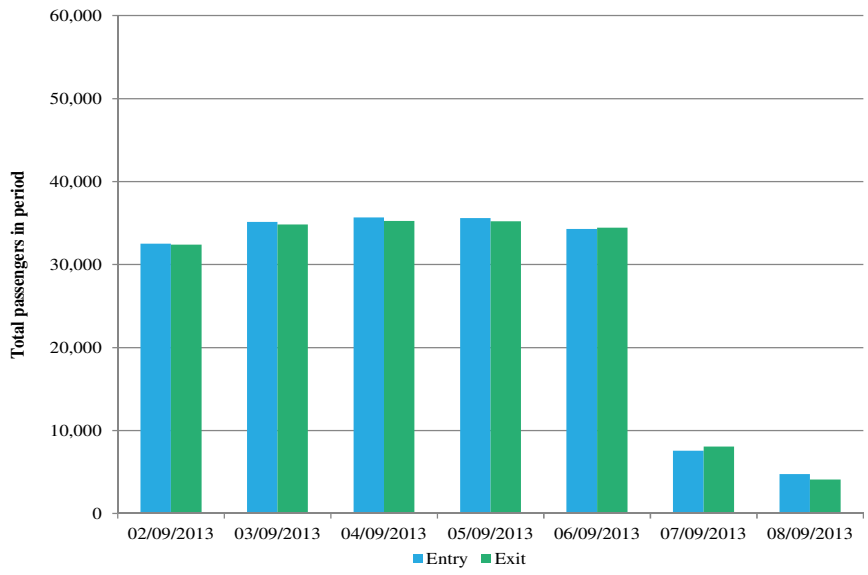
Appendix C

Transport for London data

The figures below show a selection of the data received from TfL underpinning our station-by-station analysis, as referenced in station-specific sections of this report.



Farringdon – Total Hourly Flows (two-way, September 2013)



Farringdon – Total daily flows (September 2013)

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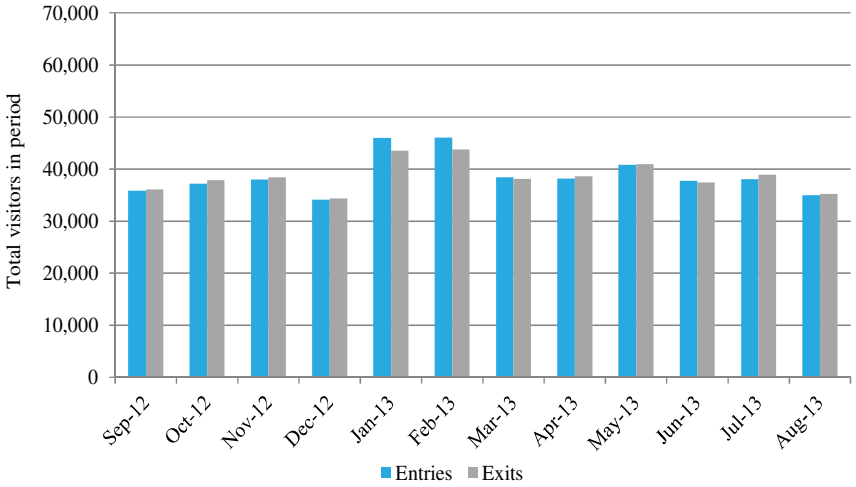
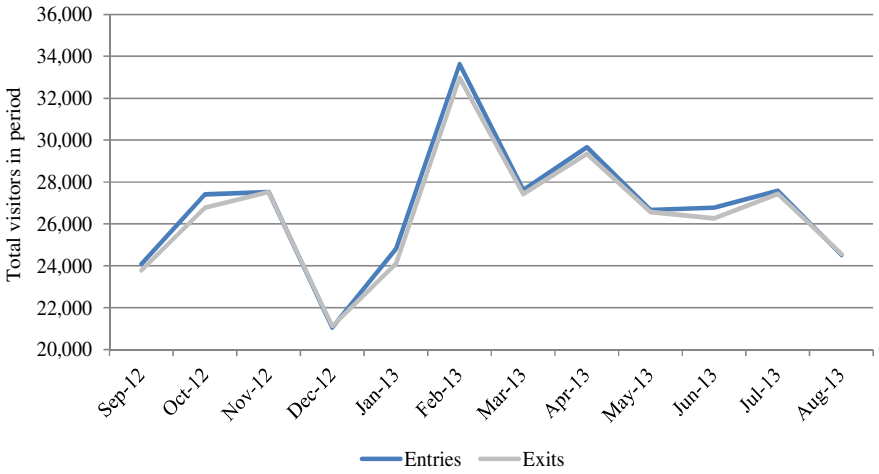
Appendix C

Transport for London data

The figures below show a selection of the data received from TfL underpinning our station-by-station analysis, as referenced in station-specific sections of this report.



Farringdon – Maximum gate flows per month



Farringdon – Average gate flows per month

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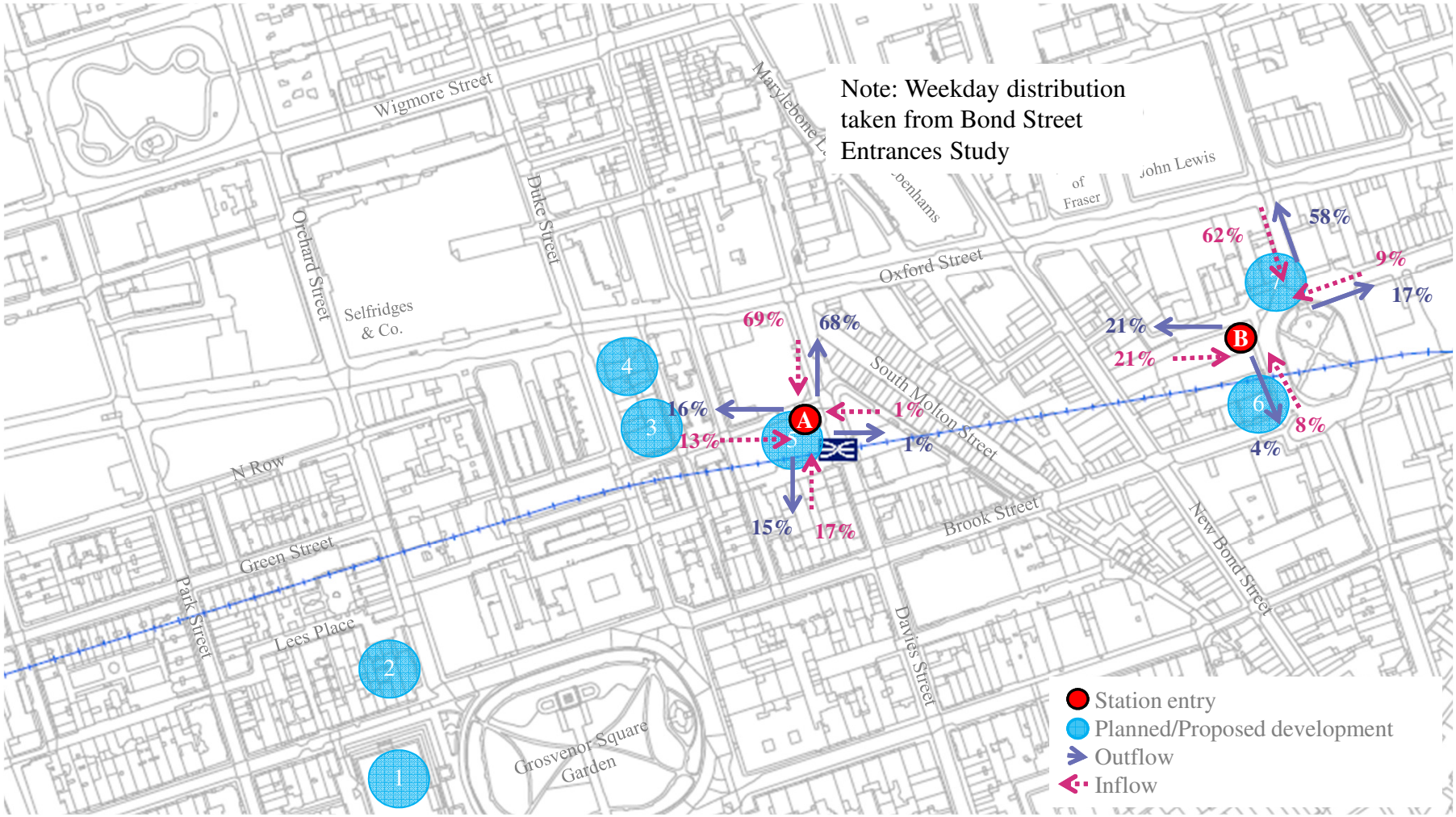
Bond Street

Distribution of passenger entry and exits: Weekday, AM and PM Peak



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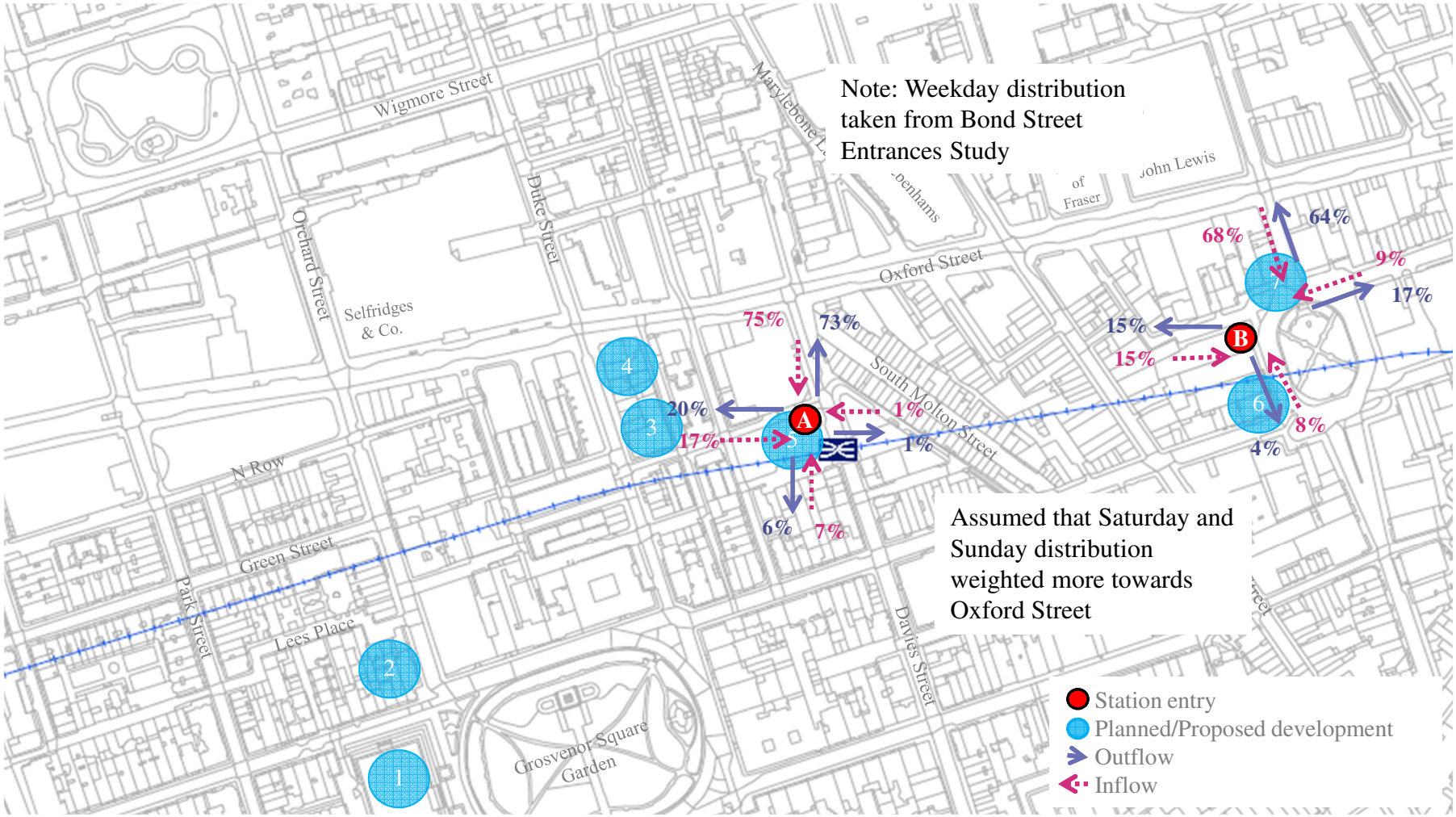
Bond Street

Distribution of passenger entry and exits: Off Peak, Saturday and Sunday



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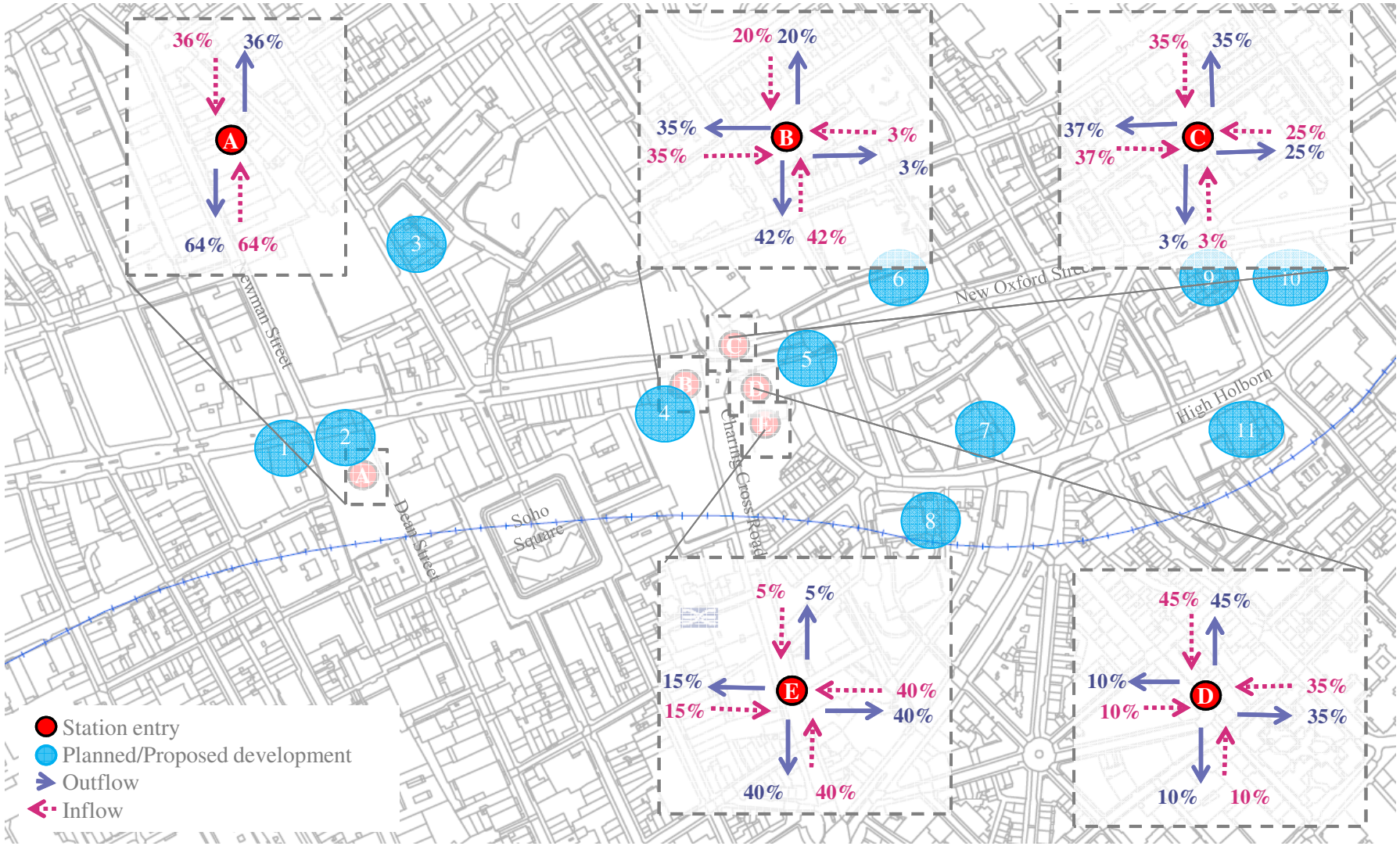
Tottenham Court Road

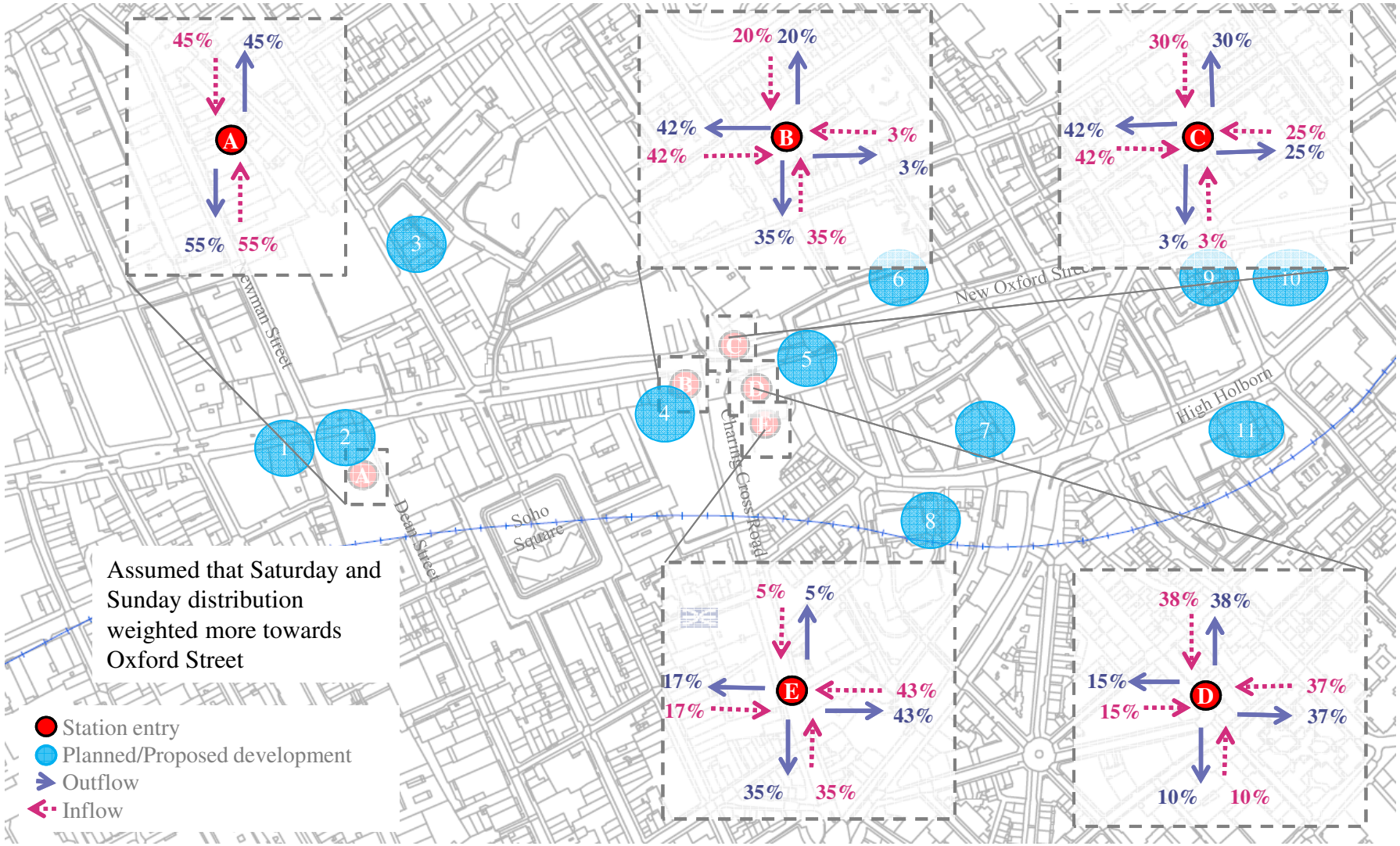
Distribution of passenger entry and exits: Weekday, AM and PM Peak



ARUP

Tottenham Court Road

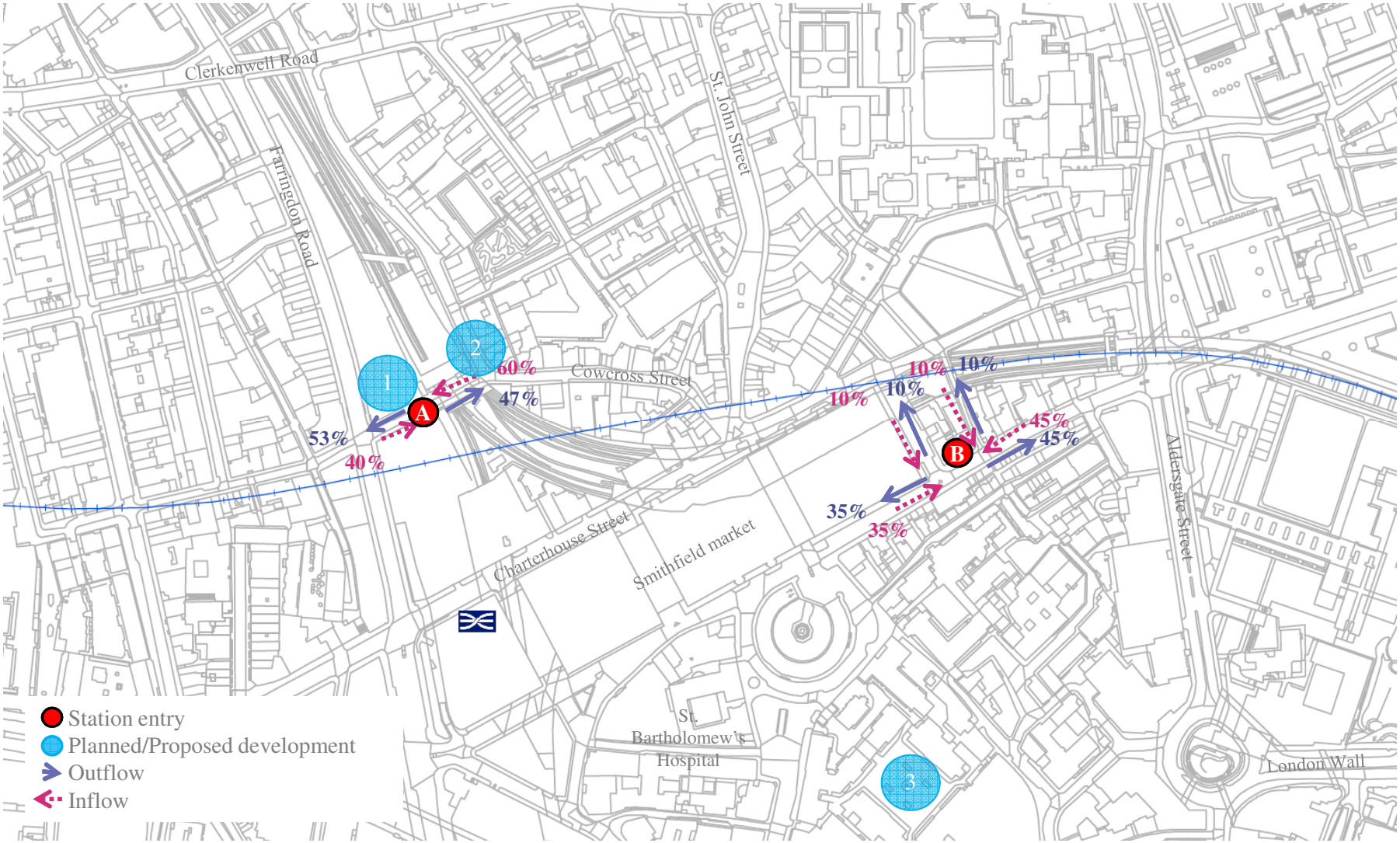
Distribution of passenger entry and exits: Off peak, Saturday and Sunday



ARUP

Farringdon

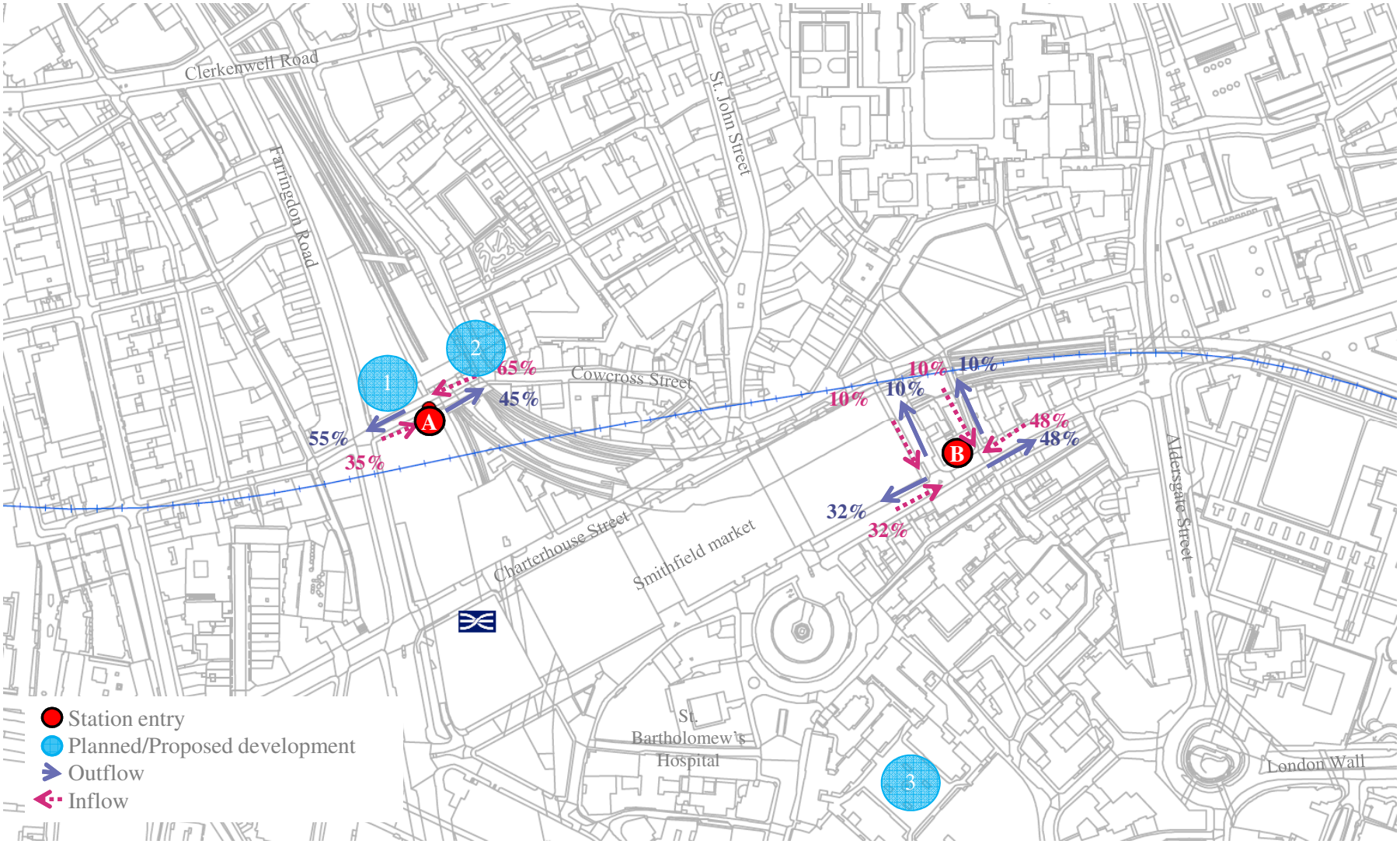
Distribution of passenger entry and exits: Weekday, AM and PM Peak



ARUP

Farringdon

Distribution of passenger entry and exits: Off peak, Saturday and Sunday



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Appendix D

Map of footfall counting locations (associated with footfall video camera locations)

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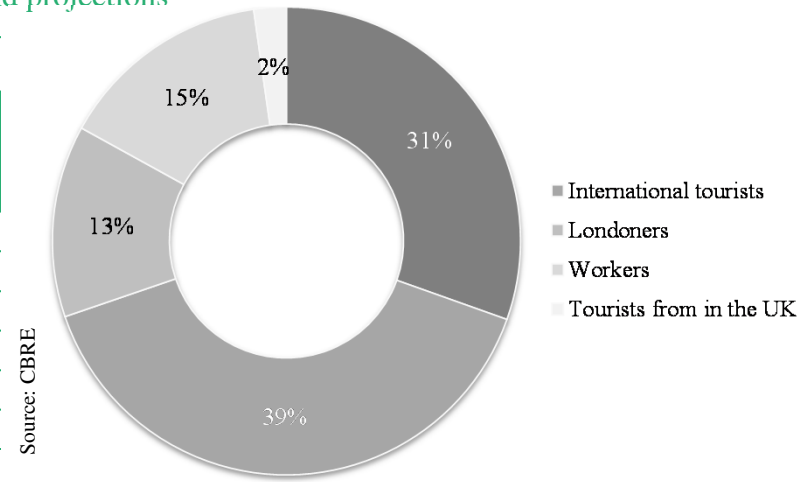
Appendix E

Snapshot of factors applied to base data in order to arrive at demand projections

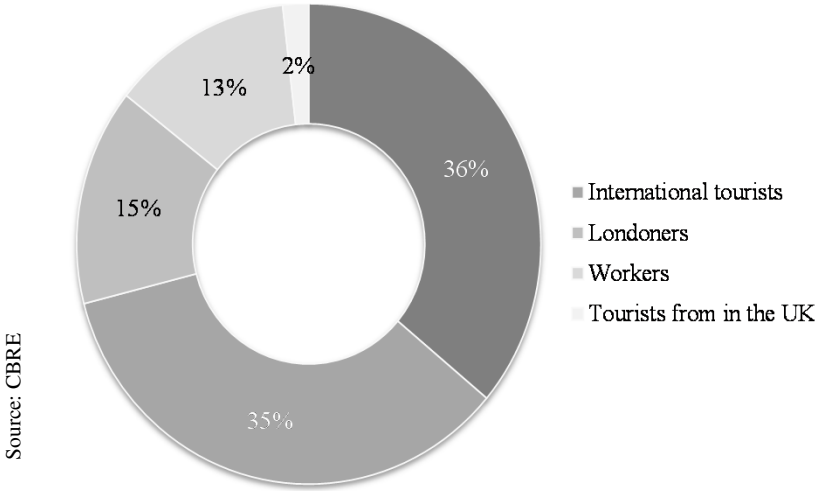
Journey purpose – Transport for London

	Inner London Residents	Outer London Residents	All London Residents
Shopping and personal business	28%	30%	29%
Leisure	29%	27%	28%
Commuting	17%	17%	17%
Other (inc. escort)	11%	13%	12%
Education	9%	8%	8%
Other work	6%	6%	6%

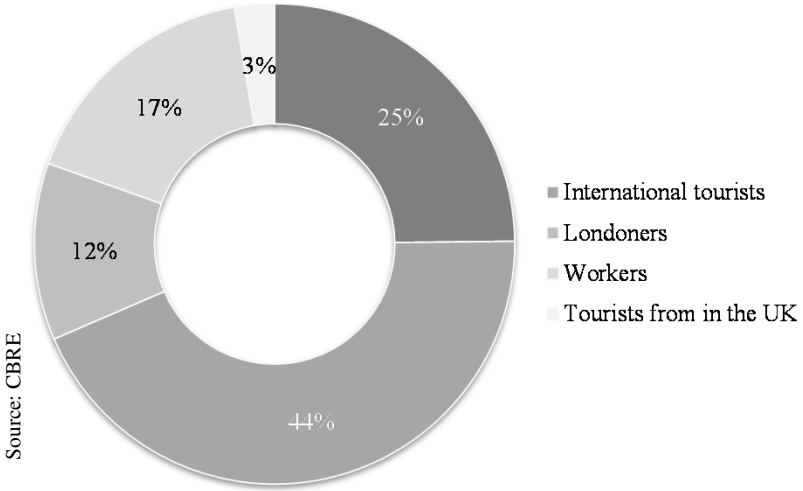
Source: Travel demand survey (2011). Note: Sorted by "All London Residents"



Implied average distribution of visitors to Oxford Street, Regent Street and Bond Street



Summer distribution of visitors to Oxford Street, Regent Street and Bond Street



Winter distribution of visitors to Oxford Street, Regent Street and Bond Street

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