# South London & Thameslink Service Improvement

## Long Term Strategic Study

## Summer 2022

NetworkRail

# Foreword

Rail is vital to the economy of South London. In a part of the capital with limited access to the Underground network, it plays a vital role in efficiently and sustainably moving large volumes of people for work, study and leisure. Like the rest of the country, ridership in South London has been hit hard by the COVID pandemic since 2020. Nevertheless it does, and will continue to, play a vital role in enabling economic, social and sustainable development in the capital. With net-zero targets for 2050, rail's role in the future transport system is more significant than ever. An effective railway needs strategic services and strategic infrastructure to deliver the most for its users. London and the South East needs rail.

This study explores different train service options depending on the level of recovery of passenger usage. It identifies what infrastructure and service changes will likely be required covering a number of future spending cycles in future decades, but is not a confirmed Delivery Plan. Until COVID recovery becomes a clear baseline, we won't know which particular trajectory we are heading on, but this study helps to prepare the industry for what might come next.

At the time of publication (Summer 2022), the funding situation for rail enhancements is extremely tight due to the substantial subsidy required to keep rail services running throughout the COVID pandemic. It should, therefore be noted that the recommendations identified in this study will likely not be progressed through the investment process until there is increasing certainty over future industry recovery from COVID.

# 0

# Executive Summary

- Why the study?
- Baselining
- Future growth?
- Recommendations

# Executive Summary

## Why the study?

This study answers the question, ***'What long-term outcomes should the rail service deliver in South London, and what whole-system packages of potential opportunities could facilitate these?'***

COVID has raised uncertainty about the future of rail, so the industry and funders need to know how various futures could look, and what infrastructure may still be required. With large projects requiring long development times, it remains appropriate to look at the vision for rail. There is an opportunity for smaller schemes in the shorter term post-COVID.

**In the context of COVID, the study adds value in a number of ways:**

1. Presents a future baseline of services and infrastructure based on future demand.
2. Identifies options for service, rolling stock and infrastructure enhancements across multiple post -COVID scenarios.
3. Identifies where there are strategic choices over future capacity allocation.
4. Provides a view on external aspirations.
5. Demonstrates alignment to Transport for London's strategies and vision.

## Baselining

**Wider context:**

Rail is shaped by the wider context in South London. This includes mode share; inner Boroughs has a higher rail mode share, whereas travel in outer Boroughs depends more heavily on cars. The Mayor's Transport Strategy sets out a target of sustainable modes catering for 80 % of journeys by 2041. Rail is crucial in this.

Secondly, housing and jobs growth both drive an increase in rail patronage. Large housing growth is expected in the Boroughs of Greenwich, Croydon and Southwark and rail can facilitate or unlock development.

Finally, COVID drastically impacted rail usage in 2020 and 2021, but there has been some recovery, with patronage in mid-2022 rising to around 75 % of pre-COVID levels.

**Network capability:**

The rail network in South London is constrained principally by 3 factors: platform capacity, flat junctions, and general track layout/throughput.

Problem locations include the flat junctions north of Croydon, at Herne Hill, at Lewisham and Hither Green. Fast and slow services share the two track railway between Bromley South and Victoria constraining higher frequencies. Terminal capacity is also severely constrained in the London Bridge area and at Victoria.

Platform lengths limit train lengths. The 'Kent Metro' area is generally 12-car capable, routes via Herne Hill and Tulse Hill are 8-car capable, and 'Victoria Sussex' Metro is 10-car capable. Ageing rolling stock is not capable of 'selective door opening', limiting lengthening on some routes.

**Connectivity:**

Connectivity is influenced by where trains go, how frequently they operate and the duration of operation throughout the day.

Whilst many links in South London have 4 trains per hour (tph) in the off-peak, the Wimbledon Loop is particularly poorly served with many stations receiving just 2tph.

Additionally, 'Kent Metro' services generally operate around 30min-1hr later than the 'Sussex Metro' on a typical weekday evening leading to inconsistencies in service provision. Frequencies on many key arteries are also much lower on a Sunday.

Finally, orbital connectivity is poor as the rail network is generally radial. Journeys between Croydon and Bromley, Brixton and Lewisham, and Balham and Catford are lengthy by rail and require interchange.

**Performance:**

Service reliability is affected by the constrained infrastructure and high frequencies. Locations that contribute to the most delay minutes include Victoria, London Bridge and the Croydon area.

Services that perform relatively well include the Wimbledon Loop and Catford Loop Thameslink services, Overground services and off-peak Greenwich Line services.

**External aspirations:**

Stakeholders, including Boroughs and London Travelwatch, generally aspire for improved connectivity, including frequent services, faster journey times and new stations. They also call for reduced crowding and improved accessibility. There is also generally strong support for TfL's Metroisation concept.

# Executive Summary

## Future growth

Future growth scenarios were tested to identify which routes would require additional capacity, and how this can be paired with connectivity aspirations, to develop service and infrastructure strategies.

Three post-COVID forecasts were modelled: Pre-COVID forecasts, medium post-COVID (-17% of pre-COVID forecast) and low post-COVID scenarios (-32% of pre-COVID forecast).

Routes in South London that were forecast to have crowding issues (above 3 people per square metre standing (ppsm), or standing for more than 20 minutes) up to mid 2030s, under a medium post-COVID scenario, included:

- Greenwich Line—London Bridge
- Hither Green—Lewisham
- Denmark Hill—Blackfriars
- Wimbledon Loop—Blackfriars
- Hackbridge Line—Clapham Junction
- Herne Hill—Brixton
- West London Line
- East London Line
- Sussex Mainline—London Bridge
- Kent Mainline—London Bridge

The total 'gap' in future capacity is termed the 'vehicle gap' and is shown in Figure 1. As can be seen, current schemes in development help to reduce the vehicle gap, but it is not enough, even in a low post-COVID scenario.

Three different Indicative Train Service Specifications were developed which manage the gap in various ways: 1) enhance with maximum efficiency and some compromise; 2) enhance with some tactical efficiencies; and 3) enhance by duplicating existing services. Three growth scenarios and three ITSS options resulted in nine possible future scenarios.

They identified a range of service and infrastructure enhancements. The more an enhancement is required across the ITSS scenarios, and across the post-COVID recovery scenarios, the more likely it will be required in the future.

### Does COVID remove the crowding problem?

The COVID pandemic may have reduced passenger crowding drastically in the short term, but **crowding will still be a problem**. All Kent Mainline services will likely see standing from 2030s at the latest. In the low post-COVID scenario, from late 2020s, Sussex Mainline services could exceed 1.5 people per square metre standing into London Bridge, with the Croydon bottleneck a key constraint in the long term. Under the medium post-COVID scenario, Blackfriars Metro and Greenwich services will exceed 3 people standing per square metre from the mid 2020s requiring additional services. Therefore investment will still be necessary to relieve bottlenecks, increase network capability and deliver improved connectivity and capacity.

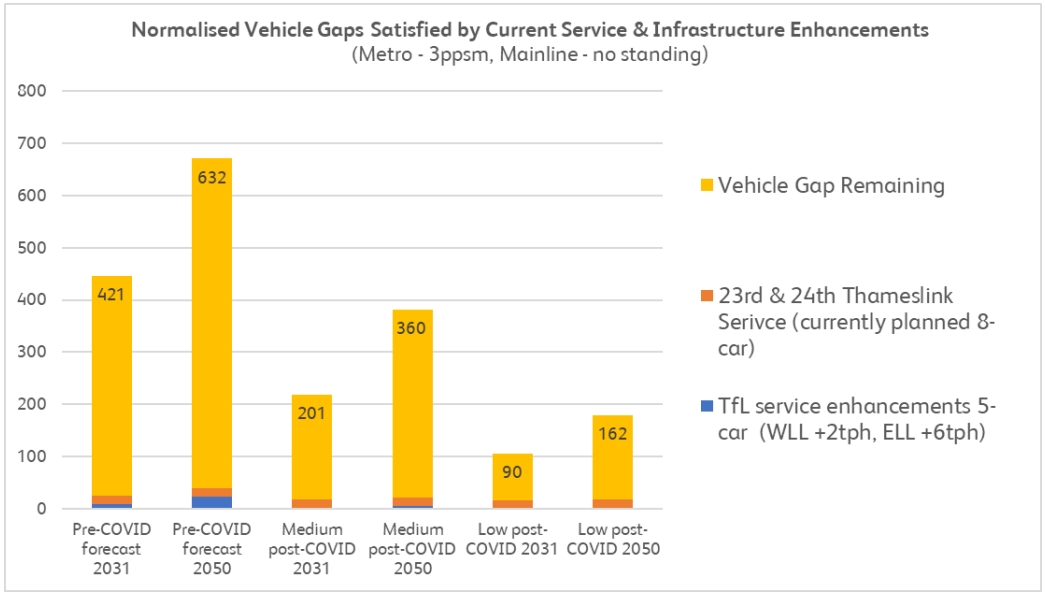


*Figure 1: Overview of 'vehicle gap' up to 2050 (based on Dec 19) under different post-COVID recovery scenarios considering current proposals in development. 'Normalised' refers to standardised rolling stock (Class 700s on Metro, Class 377 on Mainline, maximum length for routes. 'PPSM' =*

### The Strategy

The general aim across South London should be for capacity to be met by lengthening services to the maximum permitted on the infrastructure, then increase frequencies. This would ideally be supported with operation of Metro style rolling stock (i.e Class 700) on Metro routes.

Network-wide platform extensions are not seen as value for money, but tactical opportunities may exist to reduce selective door opening (SDO) working.

Increasing frequencies is then the principal strategy, with most Metro routes listed on the left requiring an additional 2tph in the peak period, even under a medium post-COVID scenario.

Mainline services into London Bridge from Sussex and Kent routes are predicted to see significant growth, even post-COVID, with increasing frequency the only opportunity beyond tactical lengthening of some services.

# Executive Summary
## Recommendations

Funding for enhancements is significantly constrained due to the COVID pandemic.

**Primary**

**Services:**

- **R1: Reactive service recovery post-COVID:** Post-COVID recovery should be monitored closely with service reinstatements and enhancements proportionate to the level of recovery.
- **R2: Wimbledon Loop Even Interval 4tph:** Further explore options to improve connectivity and capacity with a service which is potentially financially positive. This should include performance analysis.
- **R3: Clapham High Street Connectivity:** Add a Clapham High Street call to Lewisham-Victoria services following introduction of new rolling stock and safety assessment of selective door opening.
- **R4: Later departing services from central London:** Opportunities to improve late night departures should be further developed, considering its economics and interfaces with maintenance.
- **R5: Improved off-peak & Sunday frequencies:** Opportunities for enhanced off-peak frequencies should be further developed through economic analysis as well as considering the interface with capacity, operations and freight.

**Modelling:**

- **R6: 2050 Timetable**: To further confirm infrastructure requirements and net economic benefits and disbenefits. Requires greater certainty over future growth.
- **R7: Power Modelling:** Following 2050 timetable launch a route-wide power modelling study to establish future power capability requirements.

**Infrastructure Development & Rolling Stock:**

All recommendations are subject to future demand projections

- **R8: Croydon Area Bottleneck Relief:** Sussex Mainline crowding could return by the late 2030s. Relief of the 'Croydon Bottleneck', allowing service frequency increase and improved performance remains the long-term aim.
- **R9: Victoria Capability Improvement:** Development work should continue to seize opportunities to enhance terminal capability in line with planned renewals.
- **R10: Clapham Junction Capability Improvement:** Development work should identify future options to allow for enhanced Metro (including London Overground), Mainline and freight services.
- **R11: New Rolling Stock:** Replacement of ageing Metro rolling stock with Class 700 style units to reduce crowding, improve passenger experience and improve train length flexibility.
- **R12: South London Line Enhanced Flexibility:** Develop options to increase timetable flexibility and offer some Overground services during engineering.
- **R13: Station Capacity Relief Business Cases:** Develop enhancements to improve capacity at priority stations, including: Peckham Rye, Clapham Junction, Lewisham, Bromley South, Brixton and Balham.
- **R14: London Bridge Area Capability:** After +4tph in the peak hour, London Bridge, Cannon Street and Charing Cross are considered full. Opportunities to identify additional capability require further development.
- **R15: Hither Green Area Capacity:** Develop options to increase the capability of the 'Kent Metro' area and the approach into London Bridge.
- **R16: Signalling Enhancements:** Continue the Digital Rail programme and develop signal enhancements on the Kent Metro to allow for more 12-car operation.

**Secondary:**

- **R17: Sussex Metro Platform Extensions:** Develop options to explore tactical opportunities to extend more platforms to at least 10-car.
- **R18: New stations/interchange:** Continue supporting London Borough aspirations for new and improved connectivity.
- **R19: Chatham Mainline Enhancement:** Develop proposals to increase both Metro and Mainline frequencies between Bromley South and Victoria.
- **R20: Herne Hill Small Layout Enhancement:** Depending on future services, development of track remodelling options may be required at Herne Hill.
- **R21: Headway Reduction:** Subject to signalling renewal timelines, develop signalling enhancements to reduce headways. (Likely R8, R9, R10, R14 dependent)

**External Proposals:**

- This study is aligned to the vision of **TfL's Metroisation** concept, and could be viewed as the incremental steps to Metroisation as a possible end-state.
- A new station at **Camberwell** is likely to continue to challenge value for money, but new services through the potential site present opportunities to significantly reduce economic disbenefits previously modelled.
- Enhanced services between **Sutton and Belmont** would support the new Cancer Hub. Network Rail should continue to support LB Sutton.
- An **interchange at Brockley** has the potential to improve connectivity and be economically positive. Network Rail should continue to support LB Lewisham.

# 1

# Introduction

- Overview
- Study objectives
- Relationship to TfL Metroisation
- Rail Strategy for London
- Previous Work
- Study methodology
- Study outputs
- Interfacing studies
- Funding rail enhancements

# Introduction

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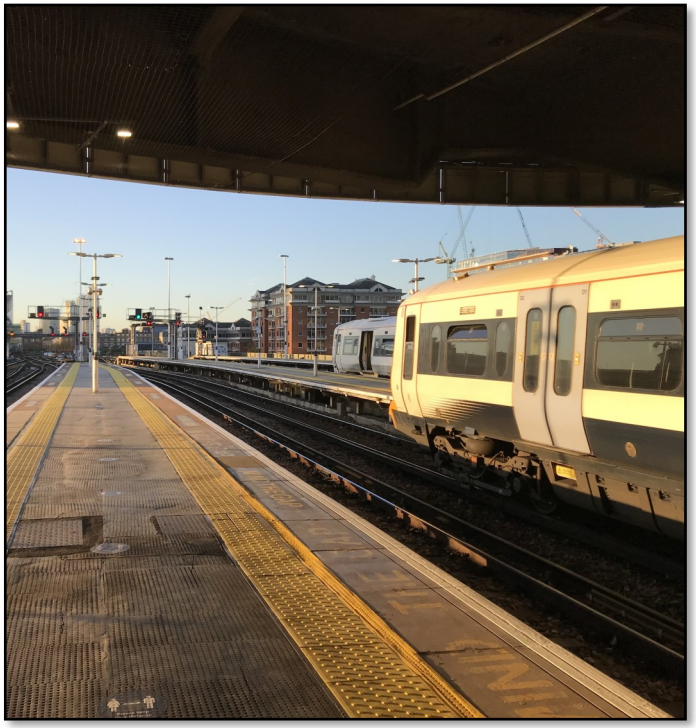


## Overview

Welcome to the South London & Thameslink Service Improvement Strategic Study. This locally focused study builds on the Kent Route Study (2018), Sussex Route Study (2015) and the preceding Route Utilisation Studies to focus on the requirements and aspirations for rail development in South London up to 2050. These studies are designed to be 'modular', providing structured strategy development over specific geographies on a rolling basis.

In December 2019, on an average weekday, around 2,300 services operated in to study area from a total of around 140 stations in 11 London Boroughs. The combined annual usage of Victoria, Blackfriars, Charing Cross, Cannon Street, and London Bridge equated to around 200million entries and exits in 2018-19 (ORR).

Prior to the COVID pandemic crowding was a critical issue on many routes, and the Greater London Authority published its 'Broken Rails' report outlining how rail journeys should improve in the short term. Since the COVID pandemic, rail usage has changed casting doubt over the case for future rail enhancements.

This study sets out to explore future scenarios in South London up to 2050, identifying whether and when service and infrastructure enhancements are necessary in different post-COVID scenarios. It explores external aspirations and considers their strategic fit and opportunity for development. From this, key next steps are identified for further development.

This study primarily focuses on the Metro and Mainline services on the Sussex and Kent networks in the Greater London Authority area.

This is part of a programme of Kent & Sussex strategic studies, and therefore network requirements outside of London will be considered as part of other studies.

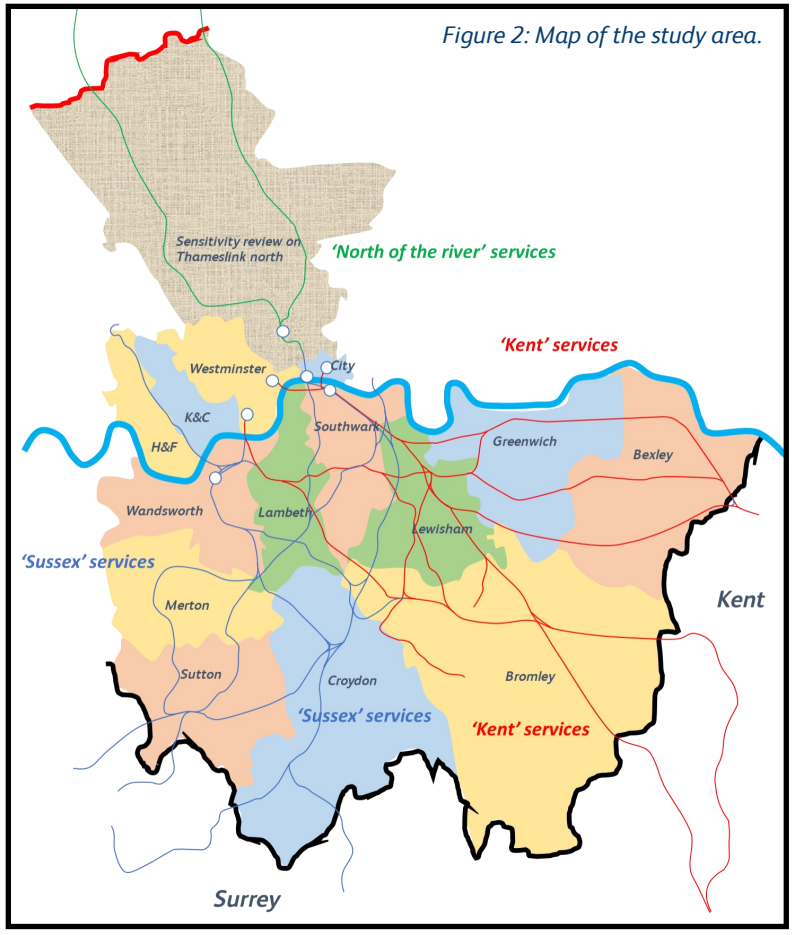



*Figure 2: Map of the study area.*

# Introduction

This Strategic Study commenced before the COVID pandemic and the resulting major changes to peoples' working lives and use of public transport. The demand forecasts used were based on the best understanding of options at the time. However, as further analysis of demand is undertaken and service changes are implemented , future projections may have to be revised.

## Study Objectives

The question this study sets out to answer is:

**"What long-term outcomes should the rail service deliver in South London, and what whole-system packages of potential opportunities could facilitate these?"**

The study's objectives are to:

- **Engage** key stakeholders, including Operators, representative bodies and authorities.
- **Understand** the challenges and opportunities for change within the rail geography.
- **Outline** key strategic service 'visions' for a changing rail network.
- **Inform** any investment and policy decisions of updated assumptions and risks, and any emerging priorities.

## TfL Metroisation

'Putting Passengers First' is at the heart of Network Rail, and TfL's proposal for Metroisation shares a similar vision. It is a vision for the future which revolutionises rail travel in South London. This strategic study is not a replacement, but presents priorities and intermediate steps for the journey between where rail is now and a possible end state vision of Metroisation.

## Stakeholder Engagement

Rail services from across the South East can travel on the same tracks as those serving London communities, sometimes requiring trade offs between through and stopping services. The scope of this study covers 11 London Boroughs, but recognising that the rail network does not stop at the city boundary, it was also important to understand requirements in Surrey and Kent. Local Authorities, Train Operators and Stakeholder Groups have been consulted throughout the development of this study to provide a complete picture of local priorities and ambitions.

## Consultees

London Borough of Southwark
London Borough of Lewisham
London Borough of Sutton
London Borough of Bexley
London Borough of Richmond
London Borough of Wandsworth
London Borough of Croydon
London Borough of Lambeth
Royal Borough of Greenwich
London Borough of Merton
London Borough of Bromley

Kent County Council
Surrey County Council
Reigate & Banstead District Council
Sevenoaks District Council

Southeastern
Govia Thameslink Rail
Arriva Rail London
Freight Operating Companies

London Travelwatch
Department for Transport
Transport for London
Transport for the South East

## Previous Work

Network Rail has previously published strategies covering South London. This includes the earlier Route Utilisation Strategy (RUS) development and, most recently, through the Kent and Sussex Route Studies published in 2018 and 2015 respectively.

This study does not necessarily invalidate previous studies. It will instead review previous assumptions and planning activities against refreshed demand projections and stakeholder priorities to identify areas of change.

# Introduction

## Study Questions

To answer the headline strategy question, sub strategic questions were developed to frame the development of the study, and included:

- SQ1: What **services are required** to meet predicted rail demand from 2026 to 2050?
- SQ2: What **infrastructure** or **technology** is required to prepare the South London rail network for the future services and demand? When and why?
- SQ3: Which **stations** are forecast to become overcapacity in South London, and what options are there to mitigate that?
- SQ4: What are **the ambitions of stakeholders** for the South London network, and what can be done to meet them?
- SQ5: How can these recommendations be **integrated** into industry plans and the current Southern Region business plan?

The study follows the process shown in Figure 3, building a solid understanding of the current operations, identifying the need for change, and then proposing options and priorities for funders to develop. The proposed options are identified through capacity analysis (i.e timetabling), economic analysis (establishing the costs and benefits), and infrastructure feasibility (establishing the constructability and potential costs).

Throughout the development of this study, there has been close formal and informal engagement with internal and external stakeholders, including Transport for London, the London Boroughs, councils, Southeastern, Govia Thameslink Railway, Arriva Rail London, London Travelwatch and the Department for Transport.


## Outputs

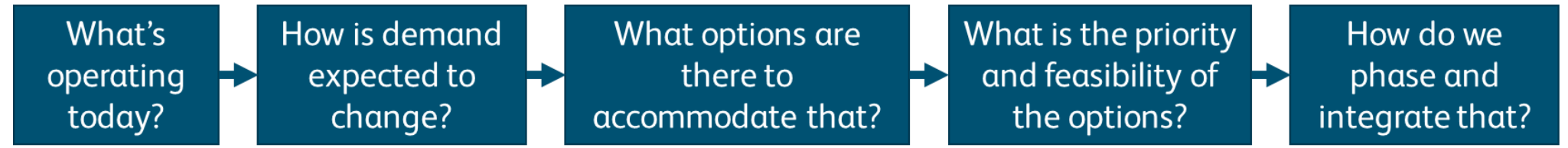
The purpose of this study is to provide an 30 year view of rail in South London. With a complex network, strong stakeholder aspirations, and significant planned infrastructure projects (rail and non-rail), the challenge was to understand how they interact and influence each other, particularly in the context of a post-COVID world.

This study does not provide the final answer or a delivery plan to solve South London's rail challenges. However, it identifies the core challenges consistent across future post-COVID scenarios and the strategic priorities for development in the near term.

This study can therefore be used to:

- Identify options to prioritise for Strategic Outline Business Case (SOBC) development when funding allows.
- Identify opportunities for enhanced renewals.
- Support the case for change for infrastructure and service proposals.
- Inform Network Rail strategies and studies and the Great British Railways (GBR) Whole Industry Strategic Plan.
- Inform future National Rail Contracts.
- Inform stakeholder aspirations and strategies, including TfL Metroisation and Local Authority plans and strategies.

*Figure 3: Study development process*



# Introduction

## Interfacing Studies

**London Rail Freight Strategy (LRFS) (Published 2021 - LINK)**

The LRFS explored how to accommodate future rail freight requirements in the London area in a context of increasing passenger and freight demand. Key freight corridors in the South London & Thameslink (SL&T) scope included the West London Line and the South London Line. Freight is also carried on the Brighton Mainline and some of the Sussex and Kent Metro routes. The LRFS presented infrastructure options and choices for funders to increase the capacity of the network which are being considered as a Programme SOBC. Conclusions from the LRFS which are relevant to the SL&T scope are included as part of this study.

**North & East Kent (N&EK) Strategic Study (due Autumn 2022)**

The N&EK study explores the 30 year strategy for rail services and infrastructure along the north Kent coast. Key interfaces with the SL&T study include connectivity between the Elizabeth Line, Dartford and Ebbsfleet, the development of the London Resort and its impact on the London rail network, and identifying the opportunities to operate additional Mainline services between north Kent and London. The development of the N&EK study parallels that of SL&T, and have both been conducted by the Kent & Sussex Strategic Planning Team.

**Traction Decarbonisation Network Strategy (Published 2020 - LINK)**

In June 2019 the UK Government set out a legislative target to achieve 'net zero' greenhouse gas emissions by 2050. For rail, the Department for Transport (DfT) asked the rail industry to explore whether it would be possible to remove all diesel-only trains from the network by 2040 in England and Wales. Interfacing with the SL&T scope, diesel services operate between London Bridge and the Uckfield. Diesel freight also operates extensively. The Southern Region is developing a strategy to decarbonise its network.

## Funding Rail Enhancements

For Government funded proposals, or proposals which affect the balance of Government funds in the rail network, the Rail Network Enhancements Pipeline (RNEP) must be followed. The pipeline is set up to review a rail investment proposal at decision points along its lifecycle, with each supported by an increasingly mature business case that successively appraises the proposal against objectives and value for money (see figure 4).

Each decision must be taken jointly by Network Rail and the Government, with funding only ever guaranteed to the next point. For this reason, only proposals past the 'Decision to Deliver' can be assumed as a baseline for future strategic development.

Any request for Government funding, through the DfT, must demonstrate alignment with the Rail Network Enhancements Pipeline strategic priorities for investment:

1. Keeping people and goods moving smoothly and safely
2. Delivering the benefits from committed programmes and projects already underway
3. Offering more: new and better journeys and opportunities for the future
4. Changing the way the rail sector works for the better.

The SL&T study sits before stage 1, exploring what is possible and desired from the rail network. The strategy recommends projects to be taken forward into RNEP. **COVID has significantly impacted the budget for rail enhancements**, meaning there is greater scrutiny on answering 'why now?' for enhancements. Identifying opportunities which align to renewals, bring money into the industry, improve connectivity or performance are likely to be more acceptable to receive funding for early development than pure capacity related schemes.

**It is not expected the recommendations identified in this study will be immediately funded** for development due to the funding constraints. Tactical opportunities to progress recommendations with limited funding will be identified, with larger recommendations put on hold until post-COVID recovery has become more certain.

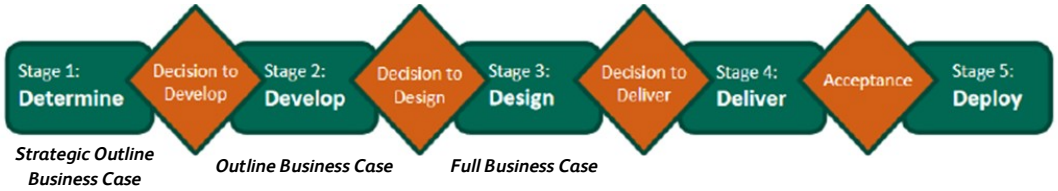



*Figure 4: Rail Network Enhancements Pipeline process*

# 2

# South London Baseline Review

- Trends
- Growth
- Markets
- Industry Structure
- Rail service
- Rolling stock
- Capability review
- Performance review
- Connectivity review
- Station review
- Pipeline infrastructure & service changes
- External aspirations
- Passenger satisfaction
- TfL Metroisation

# South London Baseline Review

## Trends

### Mode Share

There is a distinct relationship between the mode share of 'Train & Metro' and the share of car as a commuting mode. Figure 5 shows clearly that the areas with high rail mode share are central London, whilst outer boroughs such as Bexley, Sutton and Croydon, and the London adjacent areas have much lower rail mode share. It is also significant that 'South London' as an area appears to just outperform London as a whole with 'Train & Metro' mode share with 36 % and 35 % share respectively.

### Mode Use Change

Between 2005 and 2017, the transport modes which saw increased use were generally public transport and cycling (figure 6). In the same period car use reduced, however bus and walking use did too. This shows that even with a reported reduction in overall rate of trips per weekday, rail use continues to rise. This is particularly significant post-COVID pandemic, as this trend could be further exaggerated.

### Future Mode Shift

The Mayor's Transport Strategy sets out expected outcomes for mode share by 2041. Compared to sustainable modes having a mode share of around 63 % in 2018, the target is to increase this to 80 % by 2041(London.GOV). Similarly, the Department for Transport has outlined its plan to decarbonise transport, with a key emphasis on increasing use of sustainable modes—including rail (DfT). This means that the usage of public transport should grow, likely above the current status quo forecasted growth. In a post-COVID context, this drive in modal shift may help to bring public transport usage more quickly back towards pre-COVID levels.

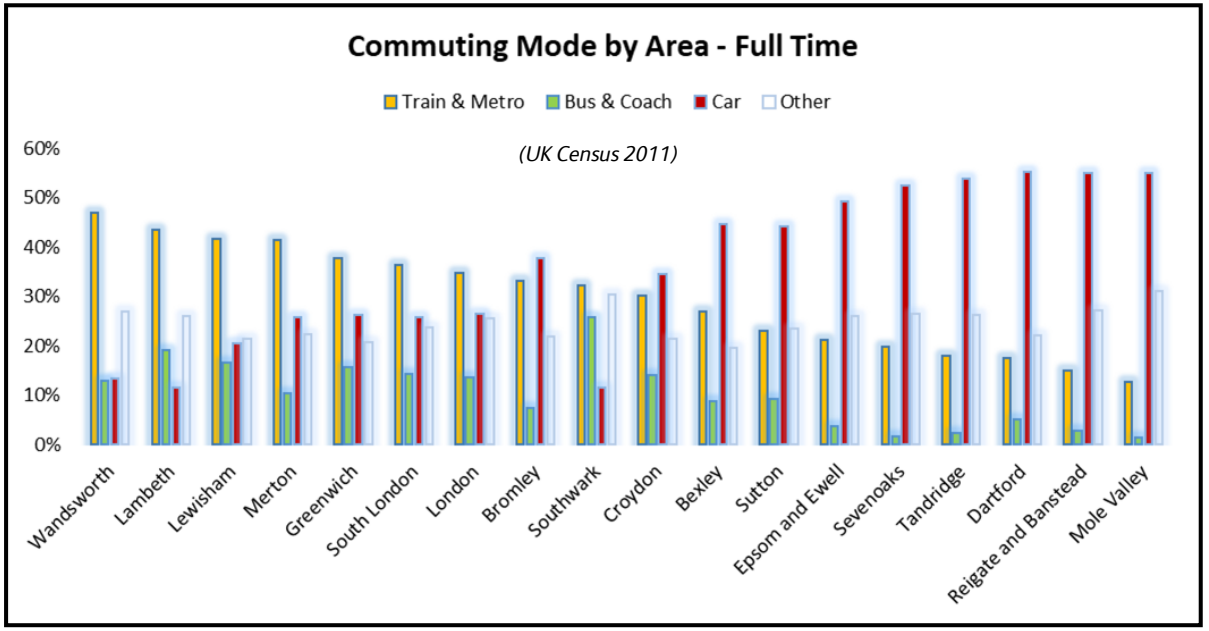



*Figure 5: Mode share across South London boroughs*

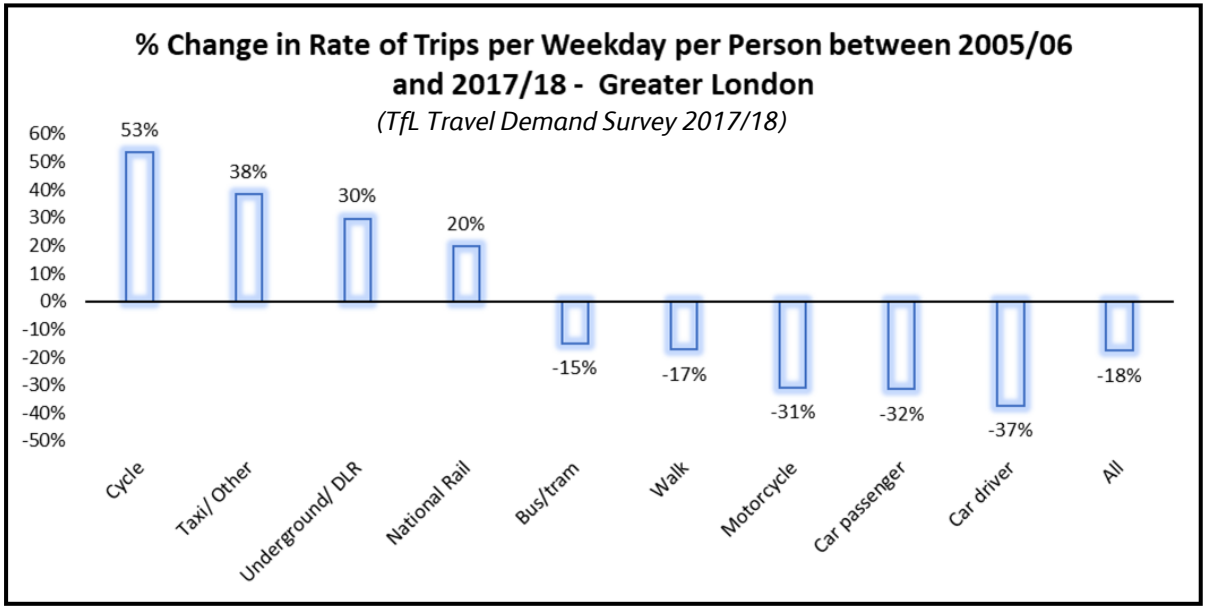



*Figure 6: Change in mode share between 2005/6 and 2017/18*

# South London Baseline Review

## Growth

### Population

London's population has risen by over 7m people since the early 1800s. It hasn't been continuously rising however, as from the 1940s the population started to shrink before rising again, by 1.8m, from the early 1990s. It is now on track to reach around 10m-12m by 2050 (London.GOV).

### Rail Growth

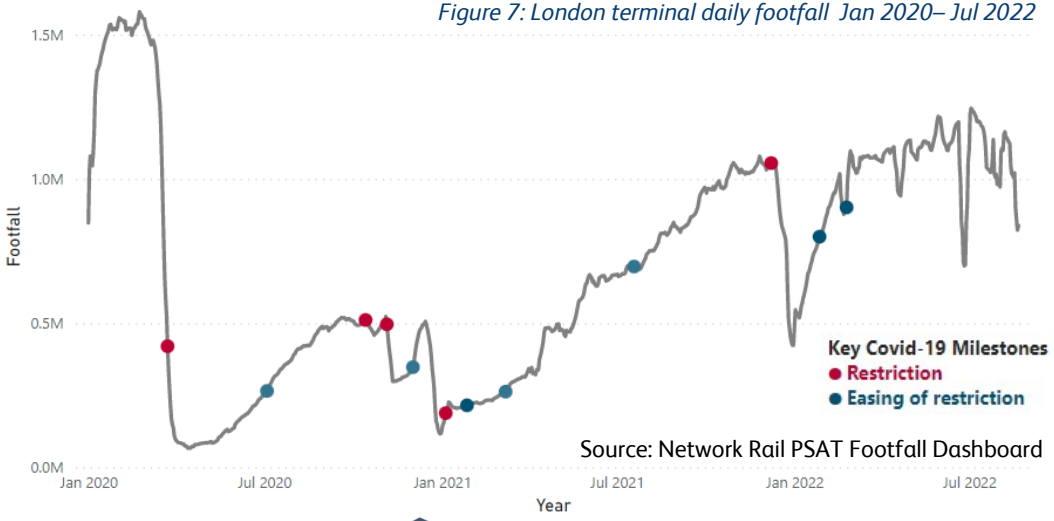
Over the last 10 years, the landscape of services within the study area has changed considerably as investment has brought in enhanced services. Major investment programmes, such as Thameslink and the East London Line extension, have provided a significant amount of additional capacity.

This increase in capacity mirrors very strong growth observed historically on both the national and regional rail network. It is estimated that at least 320 million more journeys were made on railways in London just prior to COVID compared to 10 years before (ORR).

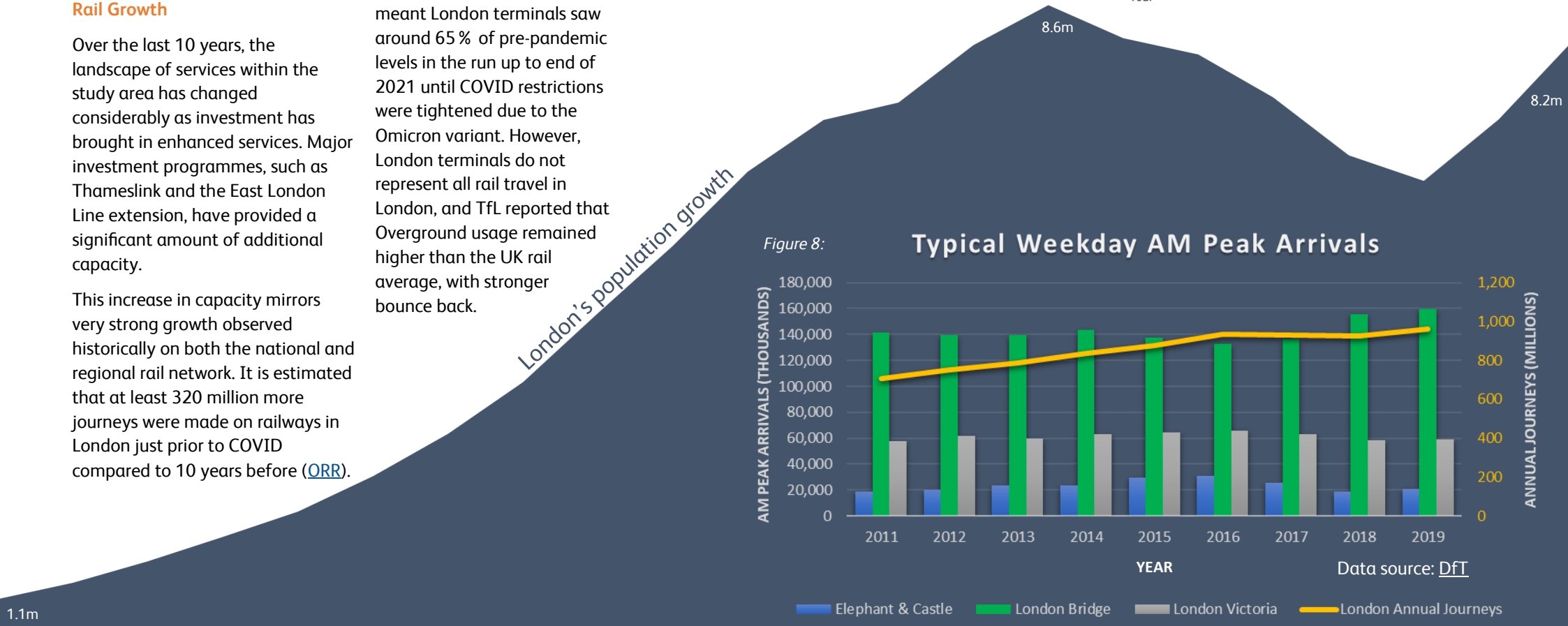
### COVID Pandemic

Compared to May 2019, May 2020 saw 93 % less rail travellers using London terminals, and on average, April 2020 to March 2021, saw London terminal usage drop by 80 % compared to equivalent 2019-2020 period. However, as the graph shows, when restrictions were partly eased rail usage bounced back. This meant London terminals saw around 65 % of pre-pandemic levels in the run up to end of 2021 until COVID restrictions were tightened due to the Omicron variant. However, London terminals do not represent all rail travel in London, and TfL reported that Overground usage remained higher than the UK rail average, with stronger bounce back.

*Figure 7: London terminal daily footfall Jan 2020– Jul 2022*




Source: Network Rail PSAT Footfall Dashboard




Population data: London.GOV

*Figure 9: Population of London from 1801 to 2011*

*Figure 8:*




Data source: DfT

# South London Baseline Review
## Growth

### Jobs Growth

Pre-COVID projections indicated that approximately 453,000 new jobs would be created within the London Boroughs in scope by 2031 (London.GOV). Of these, the City of London and Southwark are highest with 90,000 and 64,000 new jobs respectively. As shown on page 13, rail is the key mode to access jobs in these areas.

### Housing Growth

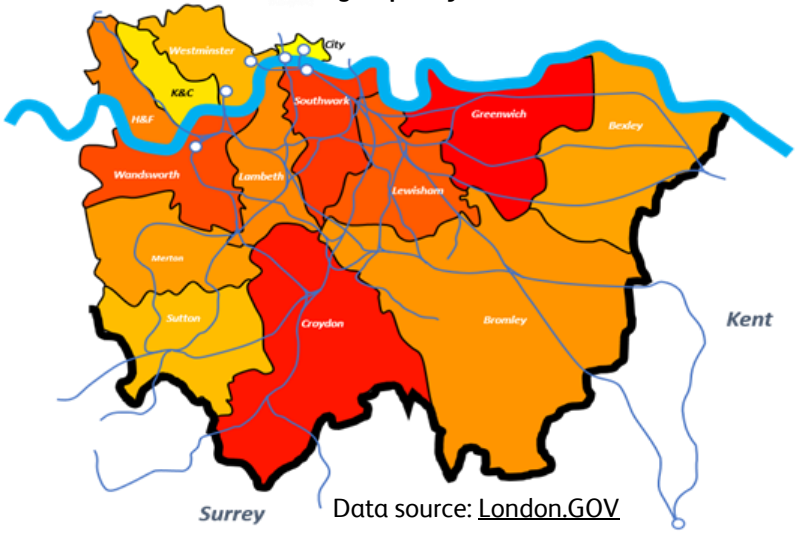
The GLA's Strategic Housing Land Availability Assessment (SHLAA) for Greater London's Boroughs has identified aggregate housing capacity across the London Boroughs (London.GOV). In total, it is estimated that the authorities in South London have capacity to deliver over 299,000 new dwellings by 2029. Of these, Greenwich, Croydon and Southwark are highest in South London with identified capacity for approximately 32,000, 29,000 and 26,000 new dwellings respectively.

Improved network capacity and targeted rail enhancements are required to support housing growth in a decarbonising economy. Housing growth outside of London will also impact rail services within London, potentially adding pressure to services which operate both as Metro within London and 'regional' services.

| Authority/Area | Total Jobs in 2031 ('000) | Jobs Growth from 2016 to 2031 ('000) | Housing Capacity to 2029 |
|---|---|---|---|
| Westminster | 831 | 16 | 10,100 |
| Hammersmith & Fulham | 175 | 23 | 16,480 |
| Kensington & Chelsea | 163 | 14 | 4,880 |
| City of London | 617 | 90 | 1,460 |
| Wandsworth | 156 | 16 | 23,100 |
| Lambeth | 201 | 22 | 15,890 |
| Southwark | 352 | 64 | 25,540 |
| Merton | 101 | 12 | 13,280 |
| Sutton | 84 | 4 | 9,390 |
| Croydon | 150 | 10 | 29,490 |
| Lewisham | 91 | 10 | 21,170 |
| Greenwich | 103 | 11 | 32,040 |
| Bexley | 91 | 9 | 12,450 |
| Bromley | 138 | 12 | 14,240 |
| Central Activities Zone | 2,327 | 316 | N/A |

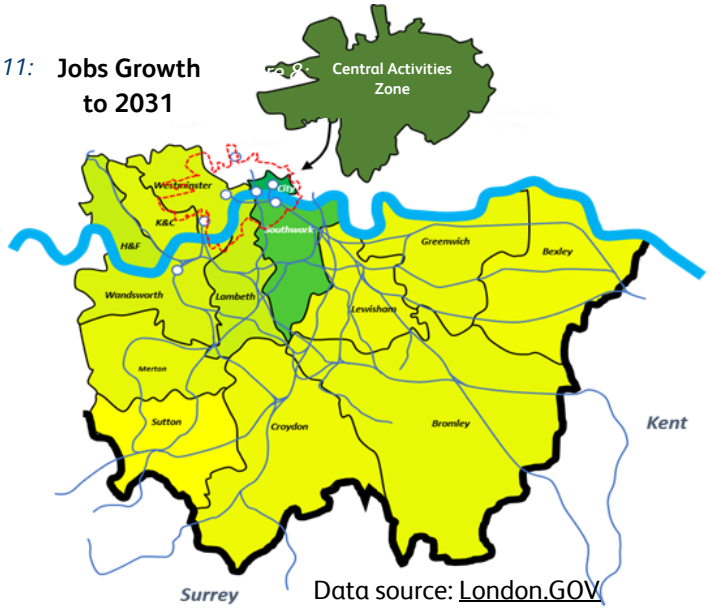
*Table 1: Expected jobs and housing growth per Borough*

*Figure 10:* **Housing Capacity to 2029**




Data source: London.GOV

*Figure 11:* **Jobs Growth to 2031**




Data source: London.GOV

# South London Baseline Review

## Markets

**Commuter:** Prior to the COVID pandemic, the rail market in London was dominated by the commuter market. Figure 12 illustrates average usage of the terminus stations in the study area in 2019, with large peaks between 0700-1000 and 1600-1800. Rail generally has a large share for most commutes of distances greater than 5km (~35% (UK Census 2011)). On a geographical basis, this is especially pronounced for central London destinations, including the Central Activities Zone (see figure 11), with rail's market share over 70% of all inbound commuters (UK Census 2011).

**Leisure:** The railway in South London provides quick access to London's leisure, tourism and night-time economy. London Victoria and Charing Cross are located within walking distance of UNESCO world heritage sites and the West End theatre district. London Victoria and London Bridge have frequent connections to Gatwick Airport and the south coast. In addition Thameslink, the London Underground and London Overground operate late night and 24 hour services to support the night time economy.

**Social:** In addition to the markets identified above, and especially for users without access to cars, the railway in London provides social value by sustainably connecting communities and services. For example, the Kings College and South London and Maudsley Hospitals in Denmark Hill are conveniently placed next to the South London Line, which provides rail access for patients and staff.

**COVID impact**: The long term impact of the COVID pandemic is uncertain but has seen a vast short term reduction in the amount of travel, particularly affecting the commuting market. The markets are rebounding at different rates, and the rail industry is continuing to monitor and establish their possible growth trajectories.

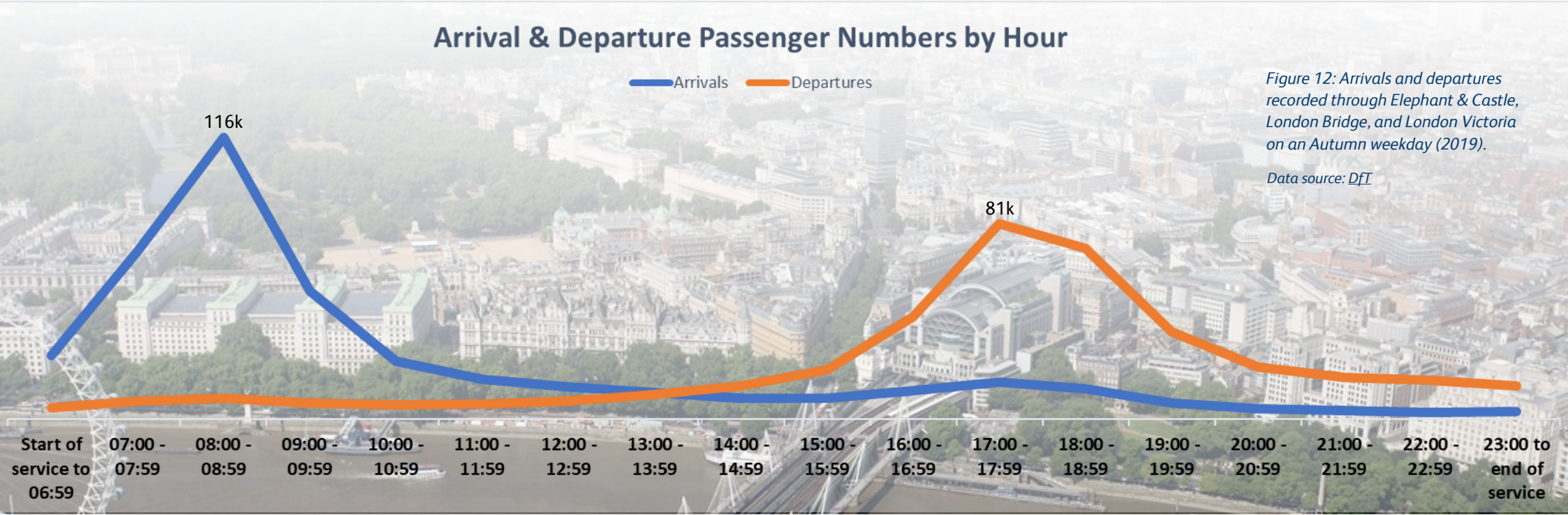



*Figure 12: Arrivals and departures recorded through Elephant & Castle, London Bridge, and London Victoria on an Autumn weekday (2019).*

*Data source: DfT*

# South London Baseline Review

## Industry Structure & Freight

### Structure of rail industry in London

Rail infrastructure in Great Britain is generally owned, maintained and enhanced by Network Rail. TfL owns some Overground and all Underground infrastructure. Rail services are operated by Train Operating Companies.

Until 2020 most rail services in South London were operated through **franchises** specified by the DfT which included the requirements for level of service operated and minimum amount of investment. Train operators bid to operate the service and held the financial risk.

TfL Overground services are operated through a TfL **Concession** which is a management contract. Here, the financial risk sits with TfL, with the operator paid to operate the service.

In light of COVID and the Williams-Shapps Rail Review, rail franchising in the England and Wales is expected to be replaced by a concession model similar to that used by TfL.

There are 3 principal rail operators in South London—Govia Thameslink Railway (GTR), Arriva Rail London (ARL), and SE Trains Limited.

**Govia Thameslink Railway (GTR):** GTR operates rail services under the brands Southern, Thameslink, Gatwick Express and Great Northern. It primarily serves the 'Sussex' network (the Thameslink, Southern and Great Northern franchise), operating into Victoria, Blackfriars and London Bridge. With the end of rail-franchising, GTR are now operating under a management contract with the DfT, with a longer term National Rail Contract in development (DfT).

**Arriva Rail London (ARL):** ARL operates all 'Overground' services on behalf of Transport for London. The brand, 'Overground' remains constant, but operators are awarded the concession to operate it. ARL will run the services until the end date of their concession in 2024.

**SE Trains Limited** operates the 'Integrated Kent' franchise, under the brand 'Southeastern'. It primarily operates into London Cannon Street, Charing Cross, Blackfriars and Victoria, as well as on High Speed One to St Pancras International. The franchise has been operated by DfT OLR Holdings since October 2021.

### Freight in London

London's rail network doesn't just deliver passenger services. There are also key freight arteries through London that connect the Channel Tunnel and the South East, to north London and the rest of the UK. The predominant freight flows in London are shown in Figure 13.

Whilst many of these services operate through the night or during off-peak periods, because of the distances some of these service travel, it is inevitable that some freight must operate in the peak period, therefore there is a key interface with any increase in passenger frequencies.

Freight is expected to grow and the London Rail Freight Strategy has explored this and the future strategy for freight in London (link). The interaction of freight with the South London & Thameslink Strategic Study is explored further on page 65.

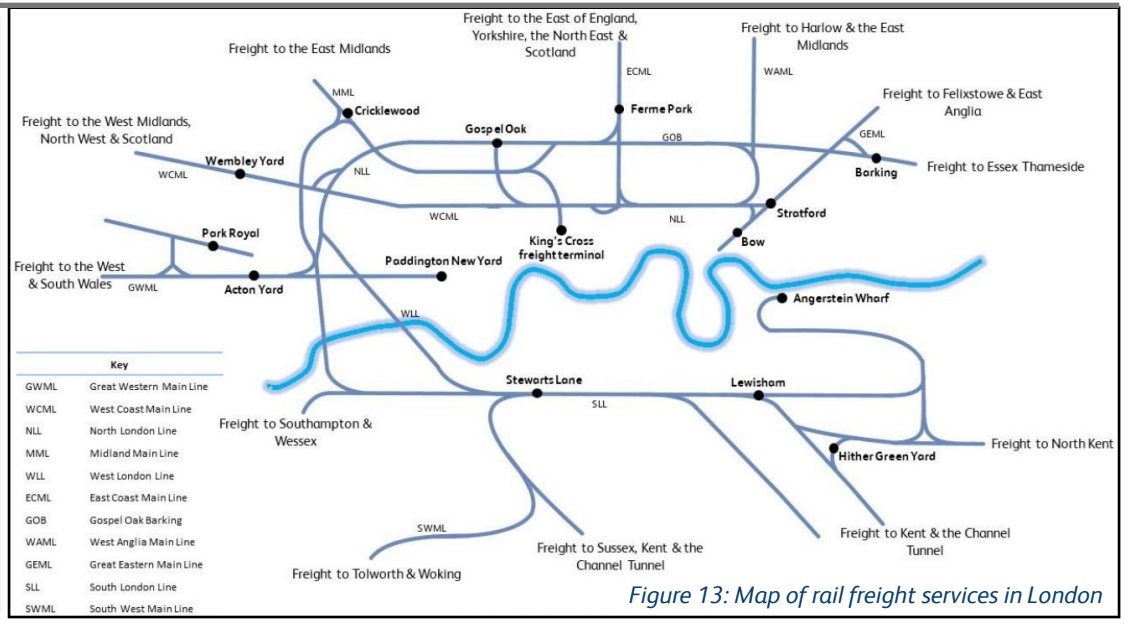



*Figure 13: Map of rail freight services in London*

# South London Baseline Review

## Rail Service

Figure 14 shows the web of rail services in South London in December 2019, operated by the brands: Southern, Thameslink, TfL Overground and Southeastern. Services feed into 7 points in London: the West London Line, Victoria, London Bridge, Charing Cross, Blackfriars, Cannon Street and the East London Line.

Services fan out of these terminals providing most lines with a 'turn-up & go' service (at least 4-6tph) generally in the off peak, with extra peak services to provide additional connectivity and capacity. Note: as of July 22 services have not been fully restored to these levels.

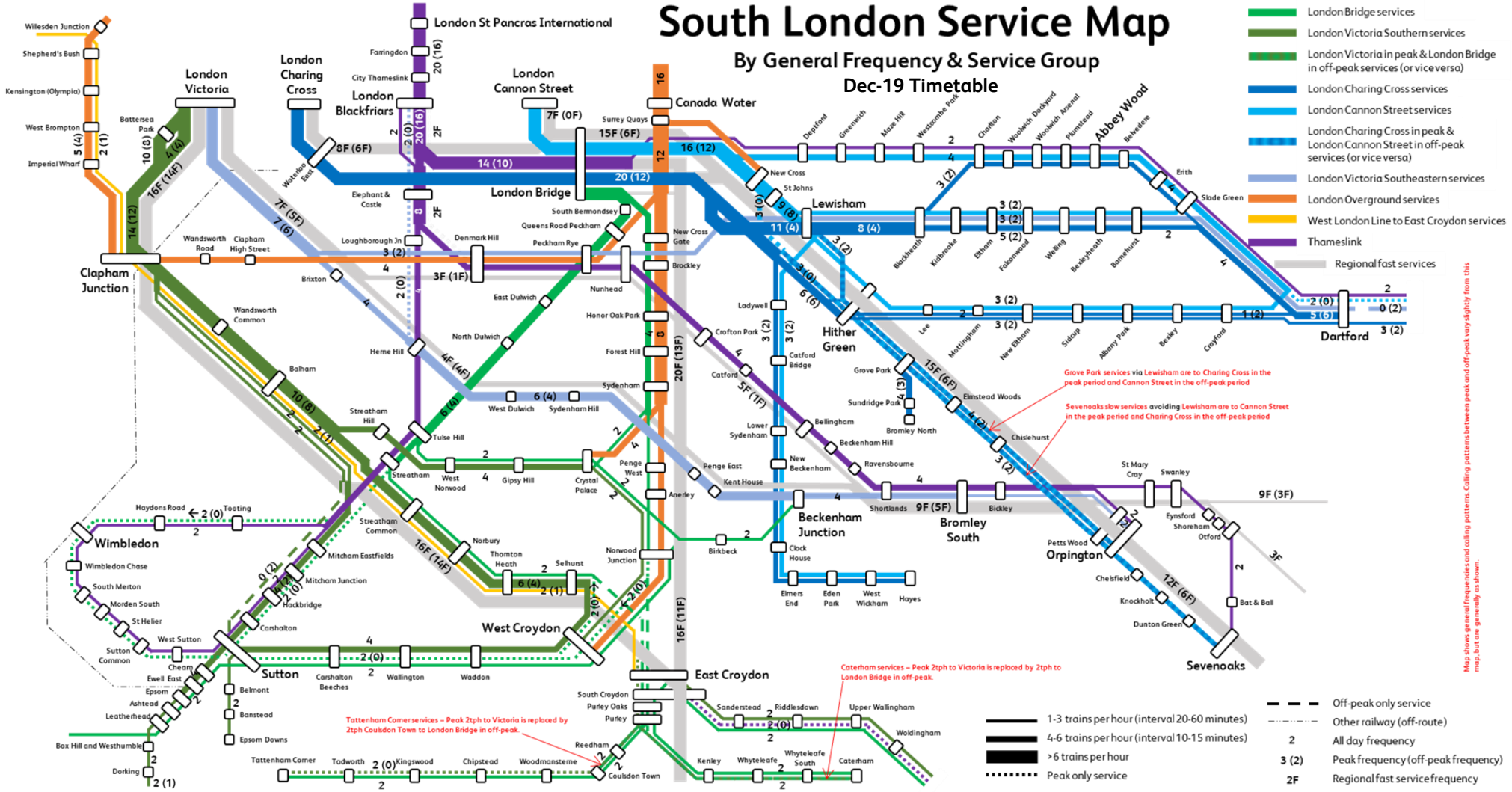



*Figure 14: Map of rail passenger services in London (December 2019 timetable)*

# South London Baseline Review

## Metro Rolling Stock

As a result of historic patterns in the procurement of rolling stock, passengers in South London experience a diversity of on-board experiences. Trains range from some of the oldest in the UK at near 40 years (Class 455s) to some of the newest at just 4 years.

Trains which offer high volume seating (such as the Class 377 or 465) can keep standing densities low initially, but once larger passenger loads are provided they quickly fill up, causing congestion. Therefore, most newer rolling stock provide a 'Metro-style' configuration with fewer seats and increased standing room to reduce crowding density.

Most 'Metro-style' trains do not offer a toilet with the rationale that it is not required for shorter commutes in central London. The provision of WiFi is also not standard although is becoming increasingly available.

On-board capacity is just one factor of the passenger experience. Transport Focus research for the 2017 Southeastern Rail Franchise also found that passengers value comfortable seats (for example not 3-2 seating) as well as other facilities such as clean toilets, both of which are lost in some models for provision of greater capacity (Transport Focus). Passenger satisfaction is explored more on page 30.

Post-COVID, should crowding be less of a concern, onboard space could be used to provide more facilities, such as for luggage, prams, toilets, which could increase passenger satisfaction and attract leisure passengers back onto the railway.


### Desiro City – Class 700 & Class 707

- **Formations –** Class 700s are 8-car or 12-car fixed formations.
  Class 707s are 5-car , but often operates in 10-car formation.
- **Capacity –** (5-car consist) – ***Seats***: 275 ***Standing area***: 134.0m²
  (8-car consist) – ***Seats***: 427 ***Standing area***: 174.9m²
  (12-car consist) – ***Seats***: 664 ***Standing area***: 270.3m²
- **Built –** 2014-2018 (Class 700), 2015-2018 (Class 707)
- **Routes served –** Thameslink Routes (Class 700) and Southeastern Metro routes (Class 707)
- **Facilities –** Aircon, Toilets (700 only), WiFi (707s & some 700s)

### Electrostar (Southeastern Metro) – Class 376

- **Formations** – Class 376s are 5-cars long but are often 'paired' together to provide 10-cars.
- **Capacity** – (10-car consist) – ***Seats:*** 456 ***Standing area***: 291.2m²
- **Built** – 2004-2005
- **Routes served** – Southeastern Metro routes from London Bridge.
- **Facilities** – No Toilets, no aircon, WiFI provided

### Capitalstar – Class 378

- **Formations** – Class 378s are 5-cars long fixed formations, constrained from further lengthening by infrastructure on the East London Line.
- **Capacity** – (5-car consist) – ***Seats:*** 186 ***Standing area:*** 130m²
- **Built** – 2009-2010
- **Routes served** – London Overground routes.
- **Facilities** – Aircon, No Toilets, No WiFi


### Electrostar (Southern Metro) – Class 377

- **Formations** – Class 377s are 3, 4, or 5 cars long. They often pair to form consists of 6, 8, 10, or 12 cars in length.
- **Capacity** – (8-car consist) – Seats: 486 Standing area: 130m²
  (10-car consist) – Seats: 600 Standing area: 158.4m²
  (12-car consist) – Seats:729 Standing area: 195.75m²
- **Built** – 2001-2014
- **Routes served** – Southern Metro services.
- **Facilities** – Aircon, Toilets and WiFi

### BR Second Generation – Class 455

- **Formations** – Class 455s are 4-cars long but are often paired together to form 8-cars.
- **Capacity** – (8-car consist) – Seats: 632 Standing area: 102.6m²
- **Built** – 1982-1985
- **Routes served** – Southern Metro routes.
- **Facilities** – WiFi, No aircon, No toilets,

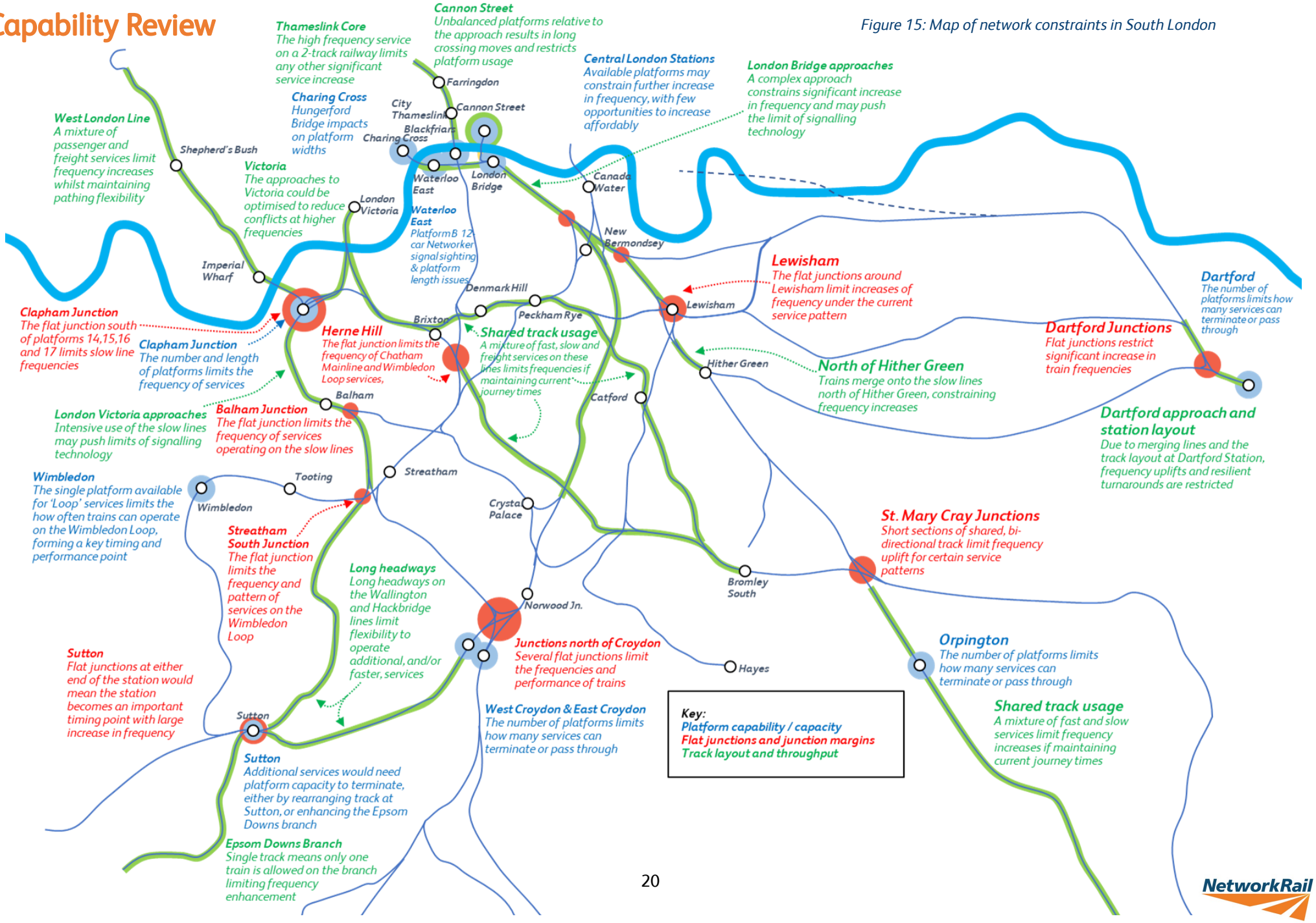

### Networker – Class 465 & Class 466

- **Formations** – Networker stock are 2 or 4-cars in length. They often join to form consists of 6, 8, 10, and 12-cars in length.
- **Capacity** – (8-car consist) – ***Seats:*** 696 ***Standing area:*** 104.4m²
  (12-car consist) - ***Seats:*** 1044 ***Standing area:*** 156.6m²
- **Built** – 1991-1995
- **Routes served** – Southeastern Metro routes.
- **Facilities** – Toilets, WiFi , no aircon

# South London Baseline Review

## Capability Review

*Figure 15: Map of network constraints in South London*



# South London Baseline Review

## Capability Review

### Platform Capability
(Blue on page 20)

Increasing the number of services operating across South London will require greater platform capability to 'turn back' trains. It is also key in delivering a resilient railway, allowing sufficient turnaround time to 'absorb' any incidents and minimize impact on the next service. This challenge is especially acute in central London stations where there is little opportunity to affordably provide additional capability due to the constraints of the River Thames and high value property.

### Flat Junctions & Margins
(Red on page 20)

The South London network contains a myriad of flat junctions, which is when the railway splits into branches without a flyover or diveunder. With flat junctions, trains on one branch must be regulated by signals to avoid conflict with trains travelling onto the other. The urbanisation of Greater London leaves few easy opportunities to 'grade separate' junctions without impacting local properties or sightlines. Despite this, it is a key method for improving services in South London.

### Track Layout & Throughput (Green on page 20)

The track layout and throughput capability of several sections in South London were designed with historic patterns and frequencies in mind. The Chatham Mainline, for example, has no dedicated 'fast' and 'slow' Lines and services are mixed on a two-track approach constraining frequency increases without severe penalties to journey times (as fast services cannot 'overtake' Metro trains). One limited section at Kent House is provided, but if utilised would introduce severe extensions to Metro journey times.

In other areas, further increases in frequencies could push signalling 'headways' to their maximum or beyond; how long can we plan before another train can run after the one before (generally around 3 minutes). The application of advanced Digital Railway signalling or Automatic Train Operation to such a complex geography requires further research and development.

### Platform Lengths

A key constraint to operating longer services is platform lengths. The Kent Metro, from London Bridge, generally operates to stations which can cater for 12-car services. The Kent Metro from Victoria, and the Sussex Metro routes are more constrained with platform lengths generally catering for 8 to 10-cars. Unless extending these platforms presents value for money, the potential to operate services longer than 8 and 10 cars is limited and increasing frequencies should be targeted first.

In some instances selective door opening is currently permitted. This is where the doors at the platform open whilst the remainder of the train overhangs. This is only permitted where the risk to passengers is low. This can impact performance, so is not an ideal solution.

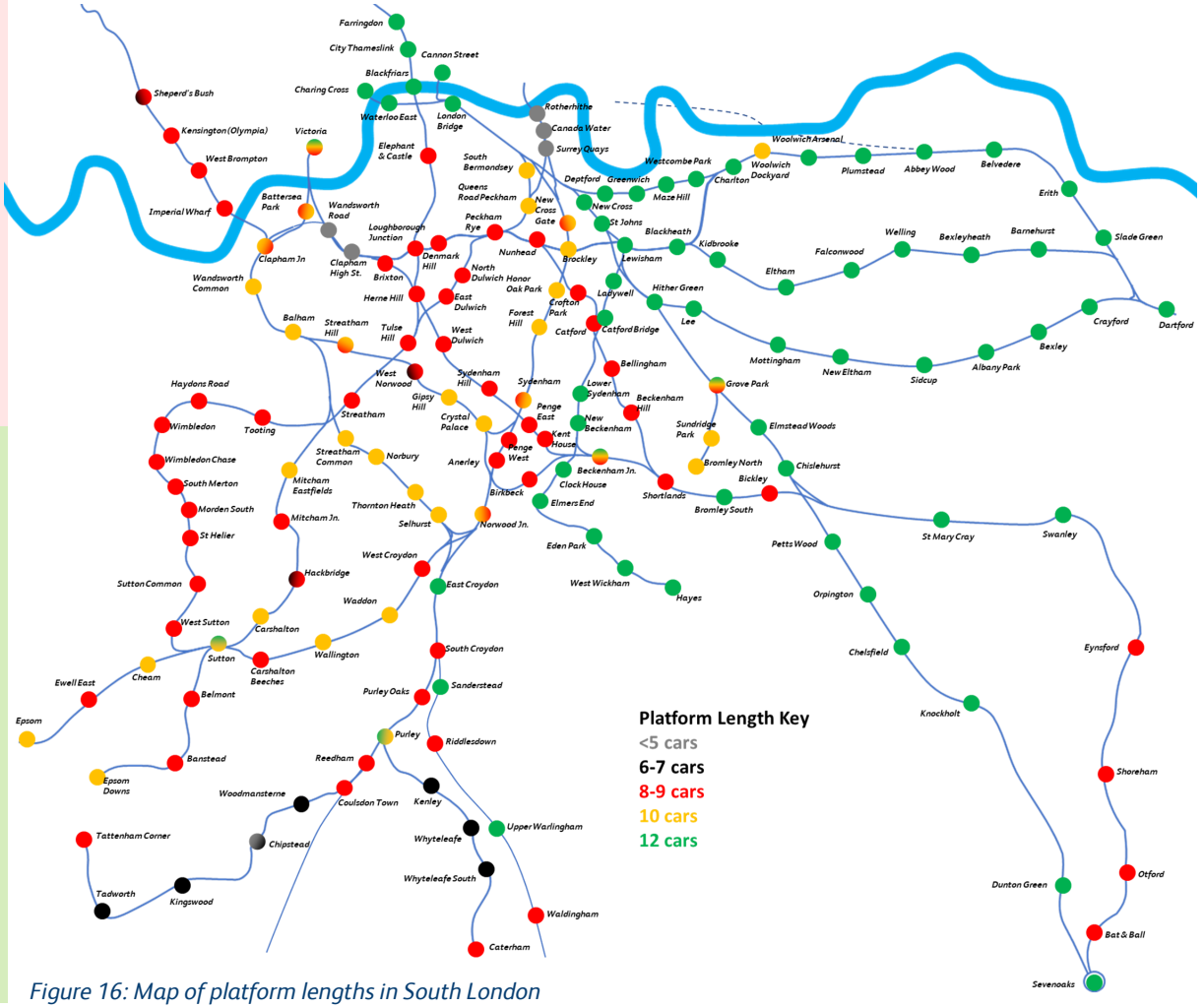



*Figure 16: Map of platform lengths in South London*

# South London Baseline Review

## Performance Review

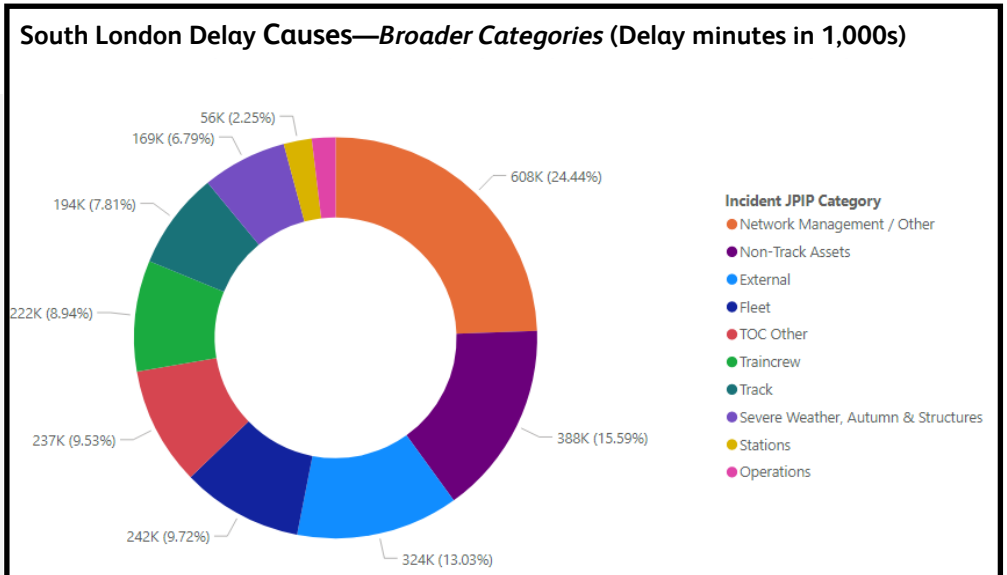
The performance of trains directly impacts the experience customers have using the network in South London. Performance covers the attribution of delays within and between Network Rail and the Train Operating Companies.

*Schedule 8* is a contract between Network Rail and the train operators. It is a performance related financial regime, where the costs of delays are allocated to the responsible organisations (ORR). This also provides high quality data to understand the cause, and 'network' of performance impacts.

Delays greater than 3 minutes are "threshold delays" and are investigated when they cause a reactionary delays >3 minutes to another service. Subthreshold delays (under 3 minutes) are generally of unknown cause.

Figure 17 shows that generally, delays are caused by network management issues (i.e train running), non-track assets (i.e signalling infrastructure, power) and 'external' issues (i.e trespass and bridge strikes).

*Figure 17: Causes of delay in South London (Pre-COVID 2019/20)*




**Top 5 better performing services in South London**

(Pre-COVID 2019/20, On Time %)

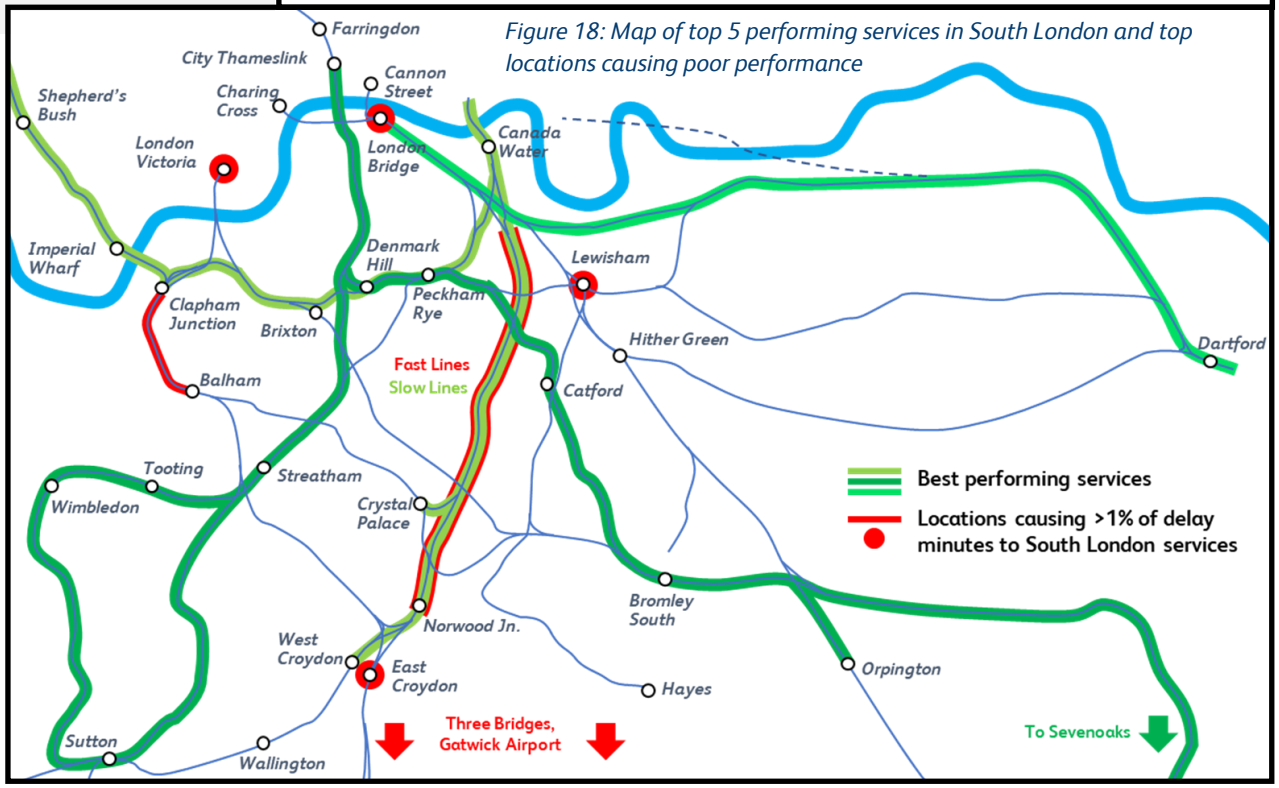
1. Off-Peak **London to Gillingham via Greenwich services** (80.0%)
2. Thameslink **Wimbledon Loop** services (79.4%)
3. **Sydenham Corridor** (Overground) (78.8%)
4. **West London Line** (Overground) (78.4%)
5. **Thameslink Sevenoaks & Orpington** to London Blackfriars (77.8%)

**Top 5 poor performance locations causing delays in South London** (Pre-COVID 2019/20, Total Delay Minutes)

1. **London Victoria** (~75% relate to Sussex services) (3.10%)
2. **London Bridge** (Incl through services, ~60% relate to Sussex services) (1.94%)
3. **East Croydon** (1.77%)
4. **Clapham Junction—Balham** (1.69%)
5. **Three Bridges** (1.68%)

*Percentage shows share of total delay caused to South London services (Metro and Mainline)*

*Figure 18: Map of top 5 performing services in South London and top locations causing poor performance*



# South London Baseline Review

## Connectivity Review

**Good Connectivity:**

Figure 19 shows average travel times around South London (data from TfL's WebCAT tool). It shows a clear favourability for connectivity to/ from central London stations, whilst outer stations have comparably limited connectivity. For example, East Croydon to London Bridge can be achieved in as little as 13 minutes.

Certain corridors have very high frequencies, such as between Balham and Victoria, East Croydon and London, and Lewisham and London Bridge. Almost all the Kent Metro routes into London Bridge also have turn-up-and-go frequencies of at least 6tph in the peak.

Many stations have multiple London terminal destinations, so more of London can be reached by a direct service.

**Poor Connectivity:**

As shown in figure 20, orbital connectivity in South London is comparatively poor to radial connectivity. For example, Croydon to Bromley is 43 minutes, requiring a change at Victoria, whereas the journey by bus is 35 minutes. Similarly, Bromley to Dartford is around an hour by rail with a change at Nunhead, or 40 minutes if driving. Finally, Brixton to Lewisham is 4.4 miles as the crow flies but is 40 minutes by tube and rail or 46 minutes by bus.

**Is rail always the solution in South London?**

Travel around London is not only done by heavy rail, but also bus, tram, underground, cycling, walking, and boat. Rail can play a part in improving connectivity within South London, but it may not always be the most effective solution. Rail performs well on moving large numbers of people on longer distance journeys at higher speed, but can't transport passengers from door-to-door. Rail will therefore likely always be part of an integrated transport network (even if the other mode is active travel).

There is the risk in further improving orbital or local connectivity by rail, longer, or more popular journeys may be compromised by slower journey times or reduced frequencies. Improved local and orbital connectivity needs to be properly appraised, with the right infrastructure, for it to positively contribute to rail's success in London.

| Fare Zone | | 1 | | 2 | | | | | 3 | | | | 4 | | 5 | | | | 6 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Fare Zone | | London Bridge | London Victoria | Peckham | Shepherds Bush | Brixton | Lewisham | Canary Wharf LU | Clapham Junction | Catford | Streatham | Wimbledon | Tooting Broadway | Woolwich | Eltham | East Croydon | Bromley South | Bexleyheath | Sutton | Orpington |
| 1 | London Bridge | | | | | | | | | | | | | | | | | | | |
| | London Victoria | | | | | | | | | | | | | | | | | | | |
| 2 | Peckham | | | | | | | | | | | | | | | | | | | |
| | Shepherds Bush | | | | | | | | | | | | | | | | | | | |
| | Brixton | | | | | | | | | | | | | | | | | | | |
| | Lewisham | | | | | | | | | | | | | | | | | | | |
| | Canary Wharf LU | | | | | | | | | | | | | | | | | | | |
| | Clapham Junction | | | | | | | | | | | | | | | | | | | |
| 3 | Catford | | | | | | | | | | | | | | | | | | | |
| | Streatham | | | | | | | | | | | | | | | | | | | |
| | Wimbledon | | | | | | | | | | | | | | | | | | | |
| | Tooting Broadway | | | | | | | | | | | | | | | | | | | |
| 4 | Woolwich | | | | | | | | | | | | | | | | | | | |
| | Eltham | | | | | | | | | | | | | | | | | | | |
| 5 | East Croydon | | | | | | | | | | | | | | | | | | | |
| | Bromley South | | | | | | | | | | | | | | | | | | | |
| | Bexleyheath | | | | | | | | | | | | | | | | | | | |
| | Sutton | | | | | | | | | | | | | | | | | | | |
| 6 | Orpington | | | | | | | | | | | | | | | | | | | |

*Figure 19: Matrix table illustrating average travel times between areas in South London. Red is low journey time, blue is a high journey time.*

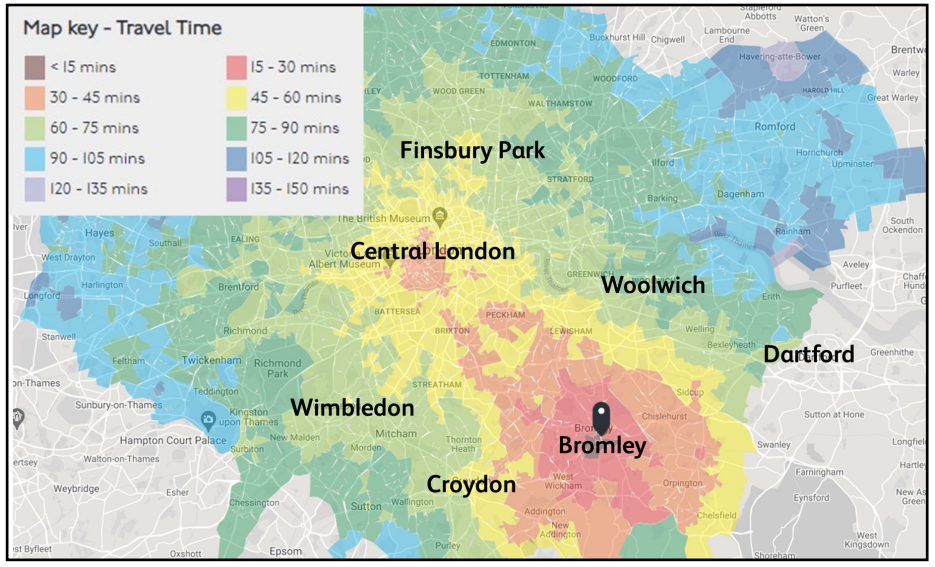



*Figure 20: Journey times from Bromley by all public transport modes*

# South London Baseline Review

## Connectivity Review

**Are trains late enough?**

North of the river is better served by the tube network than South of the river, with Underground services running late into the evening. Generally, the last Tube departures from central London are between 00:30 and 01:00. The Night Tube and Night Overground operates on Friday and Saturday nights.

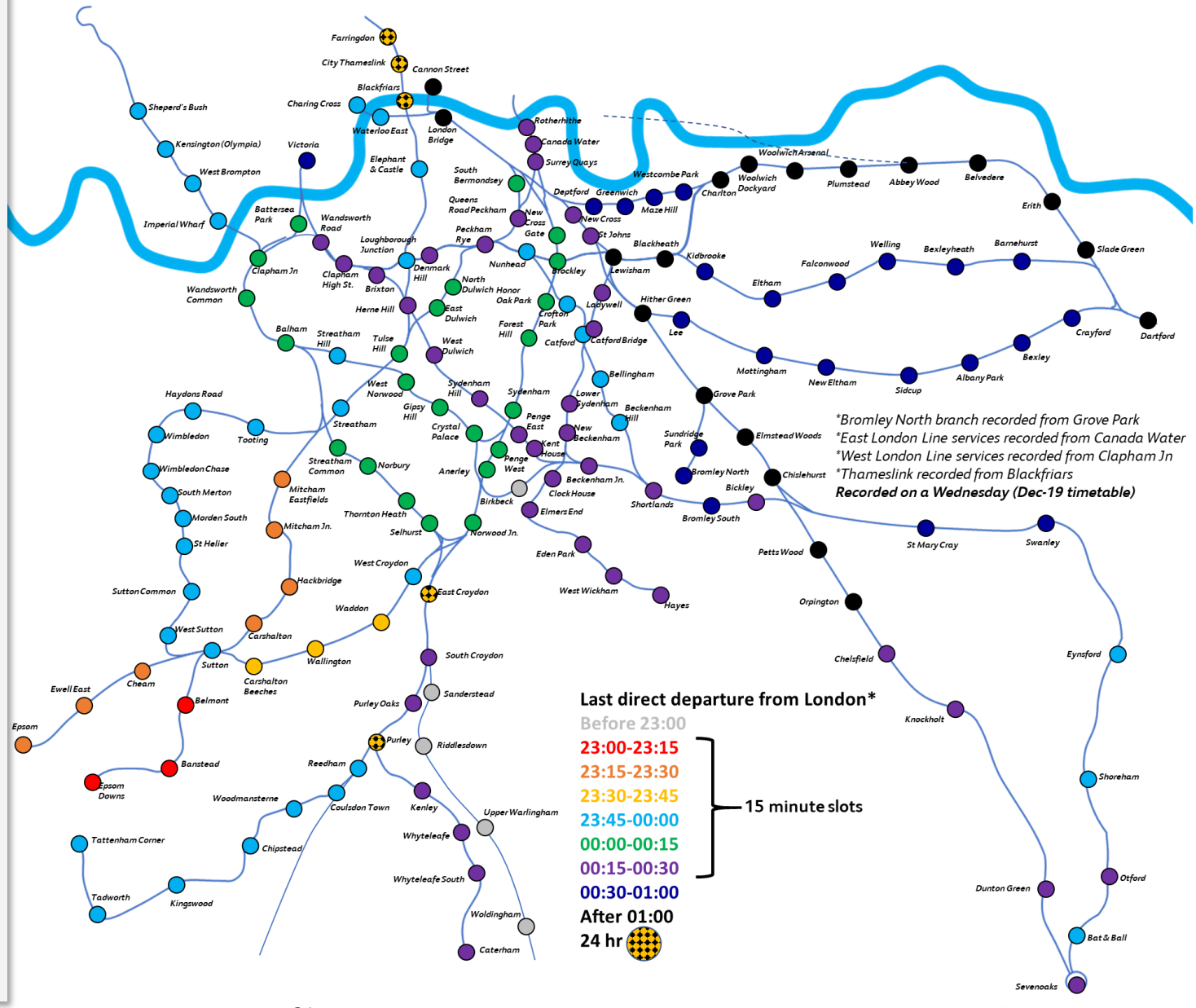
South of the river, there is a much greater reliance on the rail network. However, rail does not run as late as the tube, with last departures to the Wimbledon Loop, Hackbridge Line and Wallington Line departing before midnight on a typical mid-week evening. Those living closer into London benefit from Sussex Metro services departing central London between midnight and 00:15, but these still finish early in comparison to the tube and the Southeastern network. On Friday and Saturday nights, Southern services operate around an hour later compared to a 'standard' weekday.

Generally, Southeastern final departures are after 00:30, with some departing as late as after 01:00, although Charing Cross services do finish earlier. Generally, the Southeastern Metro operates around 30 minutes to an hour later than the GTR Metro network.

Thameslink operates 24 hour services which call at East Croydon and Purley, and provide the latest & earliest services in South London.

The provision of later services needs to be considered against cyclical maintenance patterns and non-disruptive access to the South London network. Therefore, it is a balance between providing weekends services, late night services, but also providing sufficient time for maintenance and engineering.

*Figure 21: Map showing last departure times from central London to each station in South London*



# South London Baseline Review

## Connectivity Review

**Off-peak frequencies—where are services 2tph or less?**

Whilst most routes in London have high frequencies, this is not the case everywhere. The Wimbledon Loop has 4tph clockwise and 2tph anticlockwise in the morning peak period, and 2tph in each direction in the off-peak.

Other routes such as Crystal Palace to Beckenham Junction & Norwood Junction, Norbury to Streatham, Gipsy Hill to Tulse Hill, and Sutton to Epsom Downs have 2tph operating throughout the day. In the off-peak, 1tph operates between East Croydon, the West London Line, and the West Coast Mainline.

On the Kent Metro network, the local stations to Sevenoaks generally receive 2tph, and in the off-peak, Lewisham is generally connected by 2tph to most of its surrounding lines (such as Hayes, Grove Park, Sidcup and Woolwich). This means that whilst connectivity to London remains high in the off-peak, local rail connectivity to Lewisham is relatively limited.

The stations which see the lowest frequencies in South London include those between Tooting and West Sutton (excluding Wimbledon), Birkbeck, the Epsom Downs and Tattenham Corner branches, and local stations approaching Sevenoaks and Oxted.

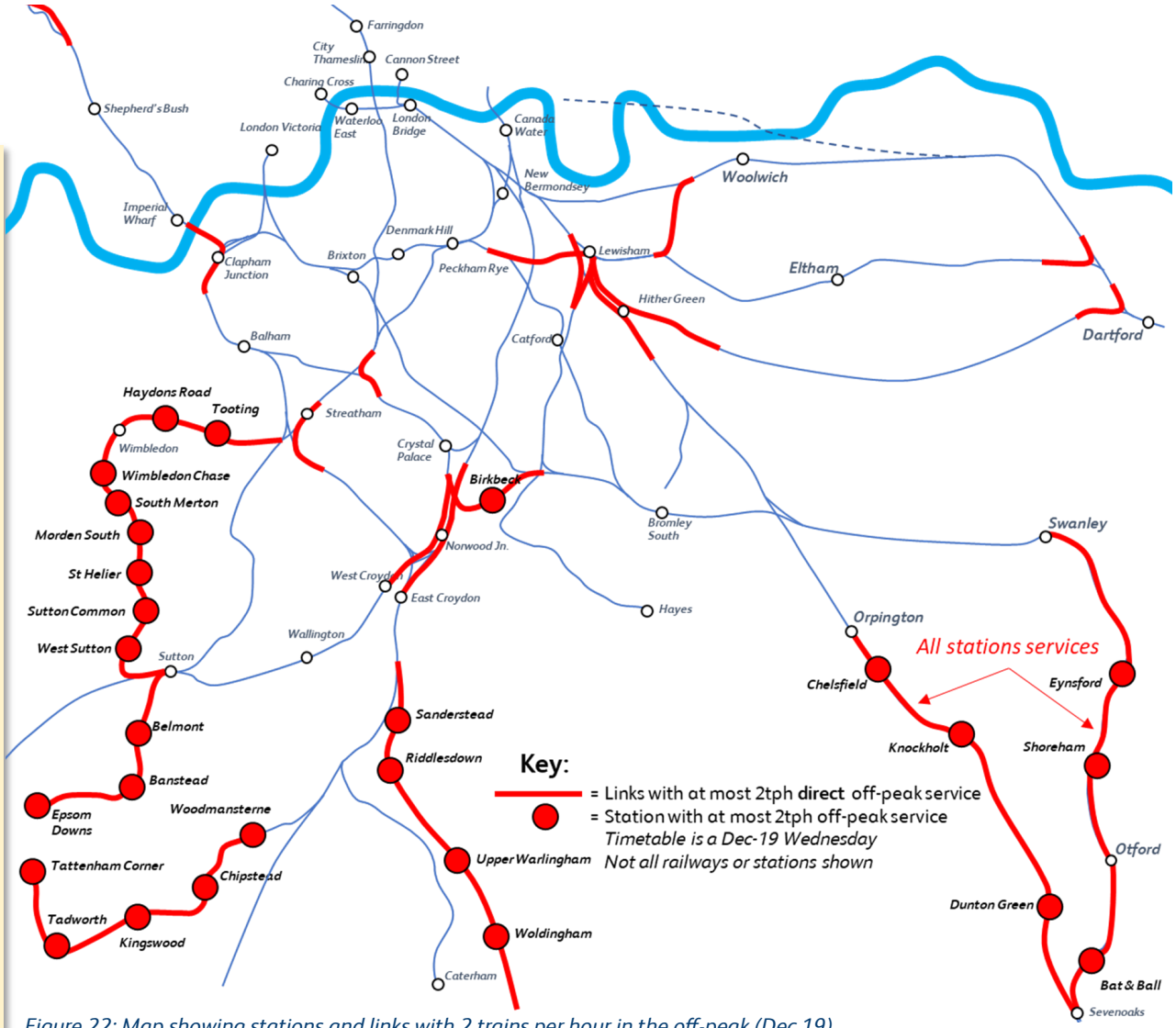



*Figure 22: Map showing stations and links with 2 trains per hour in the off-peak (Dec 19)*

**Sunday service**

Across South London, Sunday services are generally consistent with usual weekday off-peak frequencies apart from a number of exceptions. For example:

- Hayes services only operate 2tph to Cannon Street.
- Metro services via Herne Hill to Victoria only operate 2tph.
- On the Catford Loop, only the Sevenoaks—Blackfriars services operate at 2tph.
- Birkbeck is not served.
- The Streatham Hill route only sees 2tph, and the London Bridge—Victoria service does not operate.

Operating a 7 day timetable would make the service more predictable and usable on Sundays. This study has explored the impact and economic benefit of an enhanced Sunday service (see page 74).

# South London Baseline Review

## Station Review

**Station Crowding:** Network Rail's Station Capacity Team have identified priority 1, 2 & 3 stations in South London in terms of crowding and congestion. The priority number is calculated by considering the crowding severity, and the frequency of its occurrence. The list is based on pre-COVID crowding from 2019.

A score of 1 or 2 represents the highest pre-COVID priority stations, requiring intervention in the 2020s. Scores of 3 would become higher priority in the late 2020s/ early 2030s.

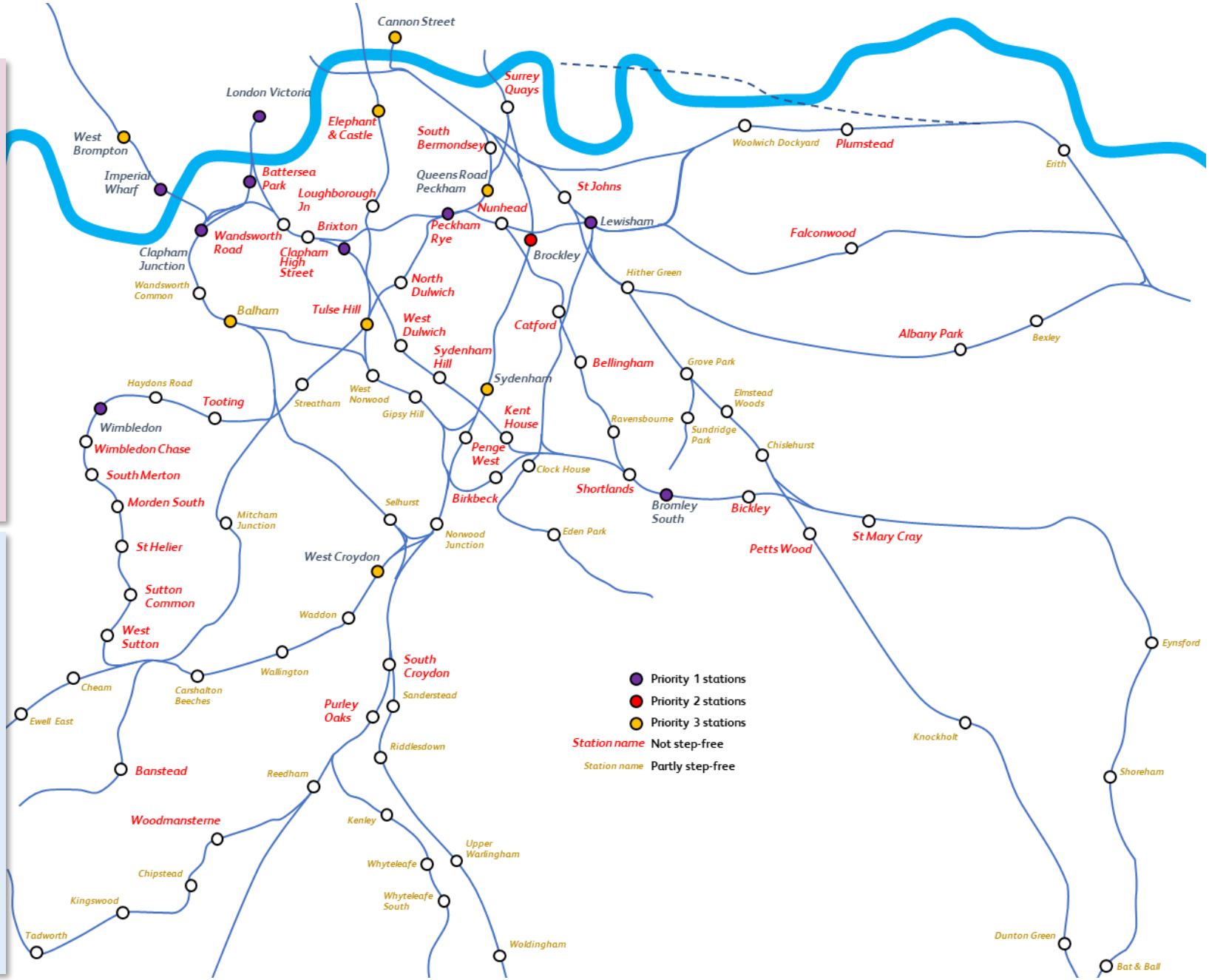
Resolving this can either come through specific crowding relief projects, or through wider station redevelopment projects. This is explored more on page 76.

**Station Accessibility:** Stations which are fully step free or partly step free are shown on the map to the right. It shows that across South London, the network generally suffers from accessibility gaps, particularly on the 'Sussex' routes. This limits the reach of rail, and therefore passenger growth for people requiring step free access.

A number of stations suffer from poor accessibility and also congestion, such as Tulse Hill, Peckham Rye and Balham.

Accessibility improvements at stations are generally funded by the 'Access for All' programme, as well as through wider station redevelopment. (see page 76).

*Figure 23: Map showing stations that will likely suffer from crowding issues in the future*



# South London Baseline Review

## Infrastructure & Service Changes in the Pipeline

### Service Changes

At the time of writing this study there were four service upgrades planned which total an additional 8 trains per hour during the peak. These include:

- London Overground: +2tph on the West London Line between Clapham Junction and Shepherd's Bush in the peaks.
  **Status:** Introduction postponed due to COVID.
- London Overground: +4tph on the East London Line as part of a Housing Infrastructure Fund for supporting new homes in LB Southwark and LB Lewisham. Additional services would be split between serving Clapham Junction and Crystal Palace.
  **Status:** Expected introduction late 2020s.
- Maidstone—London: Enhanced services between Maidstone and central London are planned for introduction in 2022.

### Infrastructure changes

Infrastructure enhancements currently in the pipeline range from station upgrades at Peckham Rye, Clapham Junction and Victoria, through to large scale projects including Victoria capability improvement and station regeneration.

These proposals are yet to progress past a 'Decision to Deliver' stage but they remain priorities for investment.

Spending on enhancements during the post-COVID recovery is constrained. As such, some projects will need to be reprogrammed and rescoped to reflect the emerging priorities and funding.

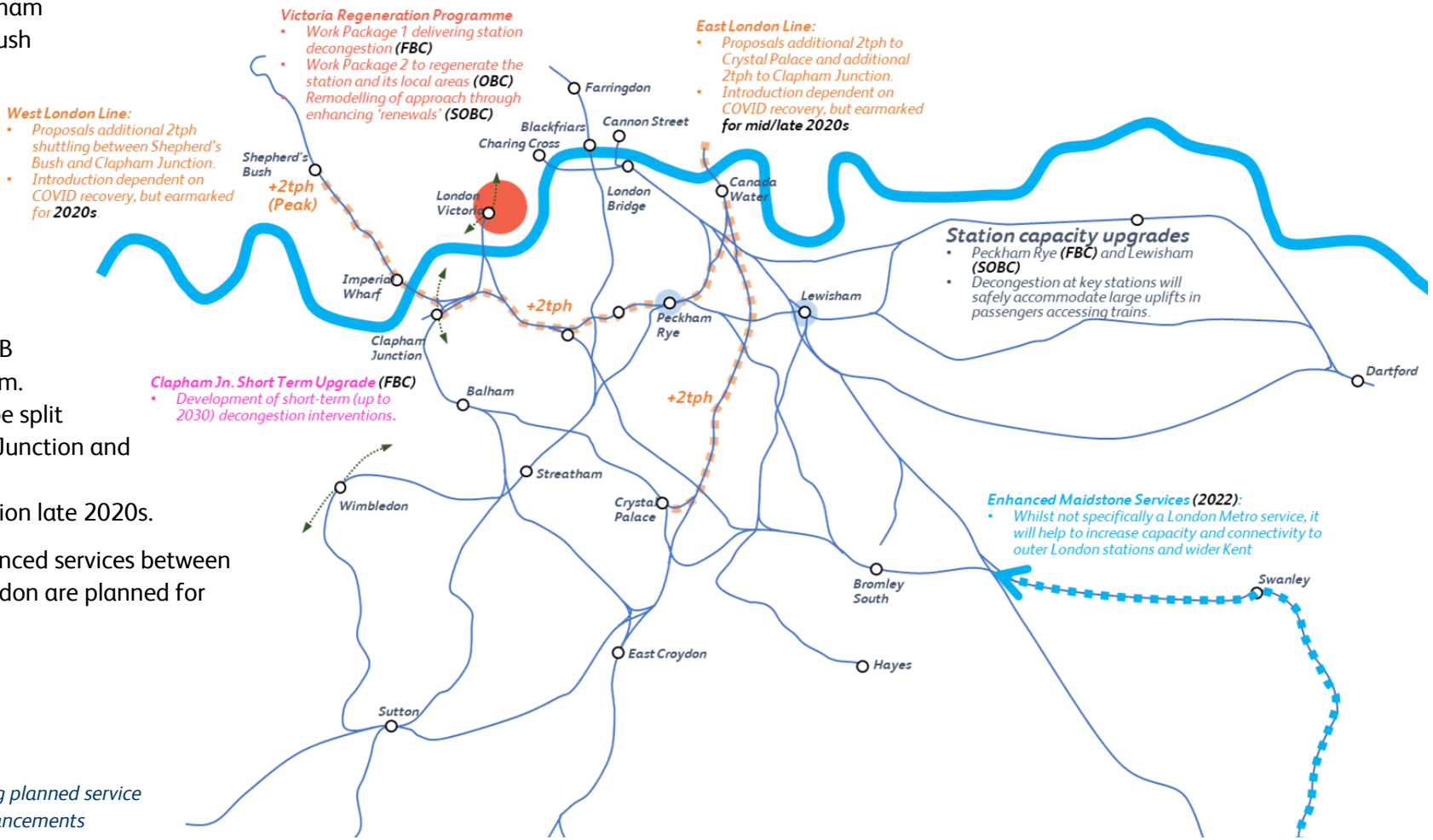
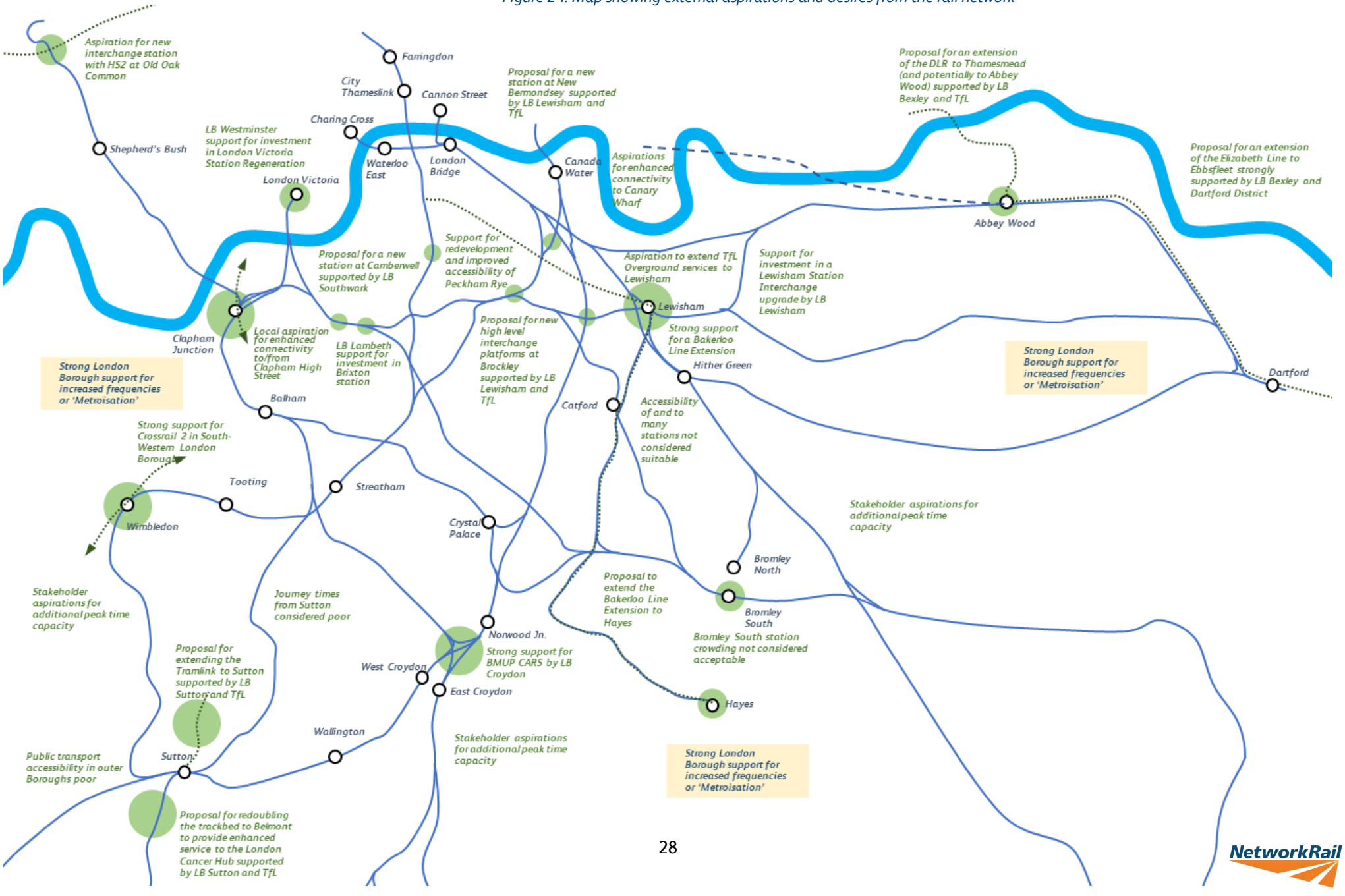



*Figure 24: Map showing planned service and infrastructure enhancements*

# South London Baseline Review

## External Aspirations

*Figure 24: Map showing external aspirations and desires from the rail network*



# South London Baseline Review

## External Aspirations

### Key themes for external aspirations

**New connections (lines & stations)**

Many of the Mayor of London's and London Borough's aspirations specifically refer to new connections, be this through new railways or new stations. For example, this includes extending The Elizabeth Line to Ebbsfleet, Crossrail 2, Bakerloo Line Extension, and DLR extensions. These are seen as key to significantly improving the transport offering in South London and delivering growth.

Similarly, new station proposals, such as Brockley High Level (Lewisham LIP), Camberwell (TfL Business Case), St George's Hospital (Wandsworth LIP), North Battersea (Wandsworth LIP), are expressed as priorities in order to improve accessibility to the railway and Borough connectivity.

**Capacity, crowding & TfL Metroisation**

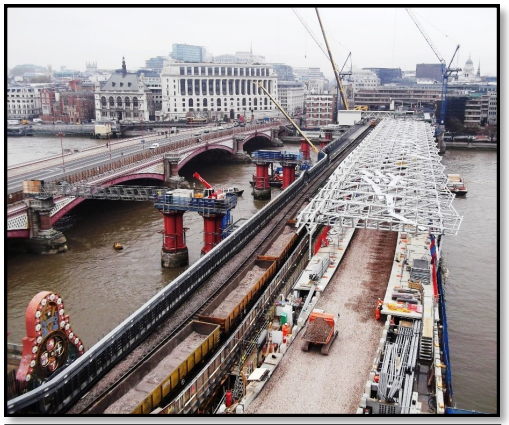
Prior to the COVID-19 pandemic crowding relief was seen as a key priority by the Mayor of London, London Boroughs, London Travelwatch and other stakeholders. Generally these aspirations for enhanced frequencies led to specific support for TfL Metroisation from almost all London Boroughs.

Connected to this is specific referral in some transport implementation plans to one of the possible mechanisms to deliver TfL Metroisation - the devolution of rail services to TfL (i.e Merton LIP).

**Accessibility**

The accessibility of stations and the transport network is key to the Mayor of London's and Borough's transport strategies and implementation plans. Borough priorities include both specific stations which require improved accessibility, such as Peckham Rye, and also lines of routes, such as the Hayes Line (Lewisham Vision for Rail).

The Mayor's transport strategy stresses improving accessibility does not just include step-free access, but other improvements, such as: up-to-date access information, improved wayfinding, tactile paving, accessible ticket machines and hearing-aid induction loops (London.GOV).



**Improved connectivity & faster journey times**

Linked to a number of other aspiration themes are the desires by many Boroughs for improved train service frequency, journey times, and orbital connectivity.

For example, LB Lewisham specifically refer to improved orbital connectivity and enhanced frequencies to Victoria and along the Sydenham Corridor (Lewisham Vision for Rail). LB Sutton and LB Merton call for increased frequencies on the Wimbledon Loop (Sutton Transport Plan). Finally, LB Bromley call for reduced journey times to other Boroughs and Canary Wharf (Bromley LIP).

# South London Baseline Review

## Passenger Satisfaction

### London Travelwatch User Priorities

- London's transport network should be accessible and open to all.
- Transport across all modes should represent good value for money.
- Transport users in London must be and feel safe at all times.
- London's transport network requires investment an innovation to meet growing demand.
- Accurate and timely information must be available across multiple channels throughout a journey.
- The industry will work together when things go wrong to get passengers to their destination.

(London Travelwatch)

Satisfaction in the South London and Thameslink service groups have generally been recovering over the last few years from a low point in 2015/16. (see figure 25). These service groups are the Metro or suburban markets broadly in scope of this study. Thameslink, for example, covers the Wimbledon Loop and Kent Metro services (to Sevenoaks, Orpington, and Rainham). Although it should be noted that following completion of Thameslink Programme in 2018, service groups were altered.

Passenger satisfaction has risen since Autumn 2016 when 75 % of respondees indicating they are fairly or very satisfied increased to 84 % in the Autumn 2019 survey. This increase correlates with reliability and performance; increases in satisfaction on the Southern and Thameslink service groups align.

During the peak period, satisfaction in the covered service groups drops considerably compared to an average weekday period. When this is broken down into categories or factors, there are some trends which dominate the decline.

The main issue is a decline in satisfaction with peak time levels of crowding on the train and a sense of value for money. This suggests that a key priority for these passengers will be investment that delivers additional capacity or reduces crowding.

*Figure 25: Graph showing satisfaction of train operators over time*

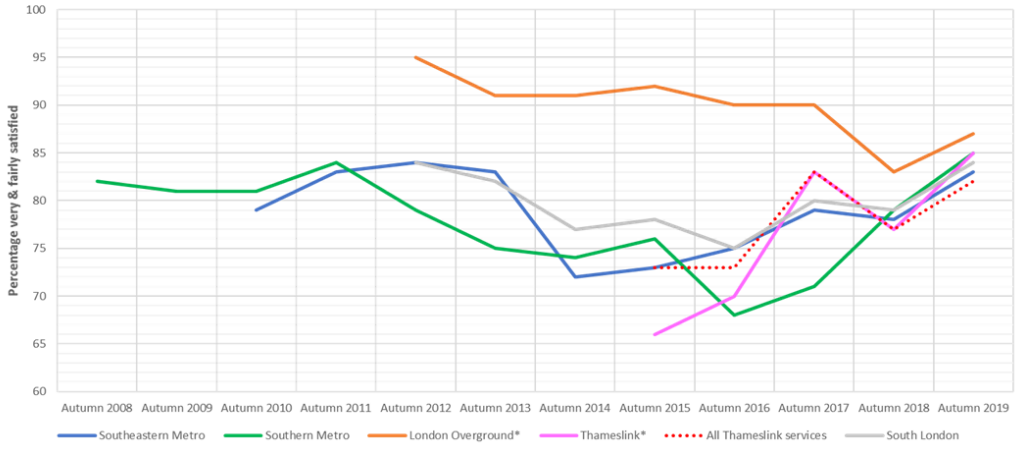



*Table 2: Change in passenger satisfaction between off-peak and peak*

| Change in weekday average satisfaction to peak time satisfaction | |
|---|---|
| **Category** | **% very or faily satisfied** |
| **South London (overall average)** | |
| Level of crowding on the train | -25 % |
| Value for money | -17 % |
| Space for luggage | -16 % |
| Comfort of seats | -15 % |
| Trust in train company | -15 % |
| **Southeastern Metro** | |
| Level of crowding on the train | -30 % |
| Connections with other services | -17 % |
| Space for luggage | -15 % |
| Comfort of seats | -14 % |
| Value for money | -12 % |
| **Southern Metro** | |
| Level of crowding on the train | -24 % |
| Value for money | -20 % |
| Trust in train company | -12 % |
| Upkeep and repair of train | -11 % |
| Length of journey | -11 % |
| **London Overground*** | |
| Level of crowding on the train | -7 % |
| Space for luggage | -5 % |
| Frequency of trains on that route | -3 % |
| Trust in train company | -3 % |
| Reliability of internet | -3 % |
| **Thameslink*** | |
| Value for money | -13 % |
| Space for luggage | -11 % |
| Punctuality of the train | -10 % |
| Level of crowding on the train | -9 % |
| Overall satisfaction | -8 % |

*Thameslink is defined here as the service groups serving the Wimbledon Loop and Kent only.
*London Overground is defined as the East London Line & South London Line

# South London Baseline Review

A link to TfL's 'Strategic Case for Metroisation' can be found HERE

## TfL Metroisation

The Mayor of London and TfL have an ambition for 'Metroisation' which proposes a step change to the rail service offering on the current GTR and Southeastern networks. Whilst there are no specific timescales for implementation, it presents a long term vision which centres around six key elements:

1. Predictable services,
2. Better connections,
3. More capacity,
4. Shorter journey times,
5. A more reliable service, from simplified service patterns
6. Better customer service and experience.

The proposal generally enhances Metro services, both in the peak and off-peak, although it also accommodates increased frequencies on Mainline services to Victoria and London Bridge resulting from long term Brighton Mainline Upgrade plans.

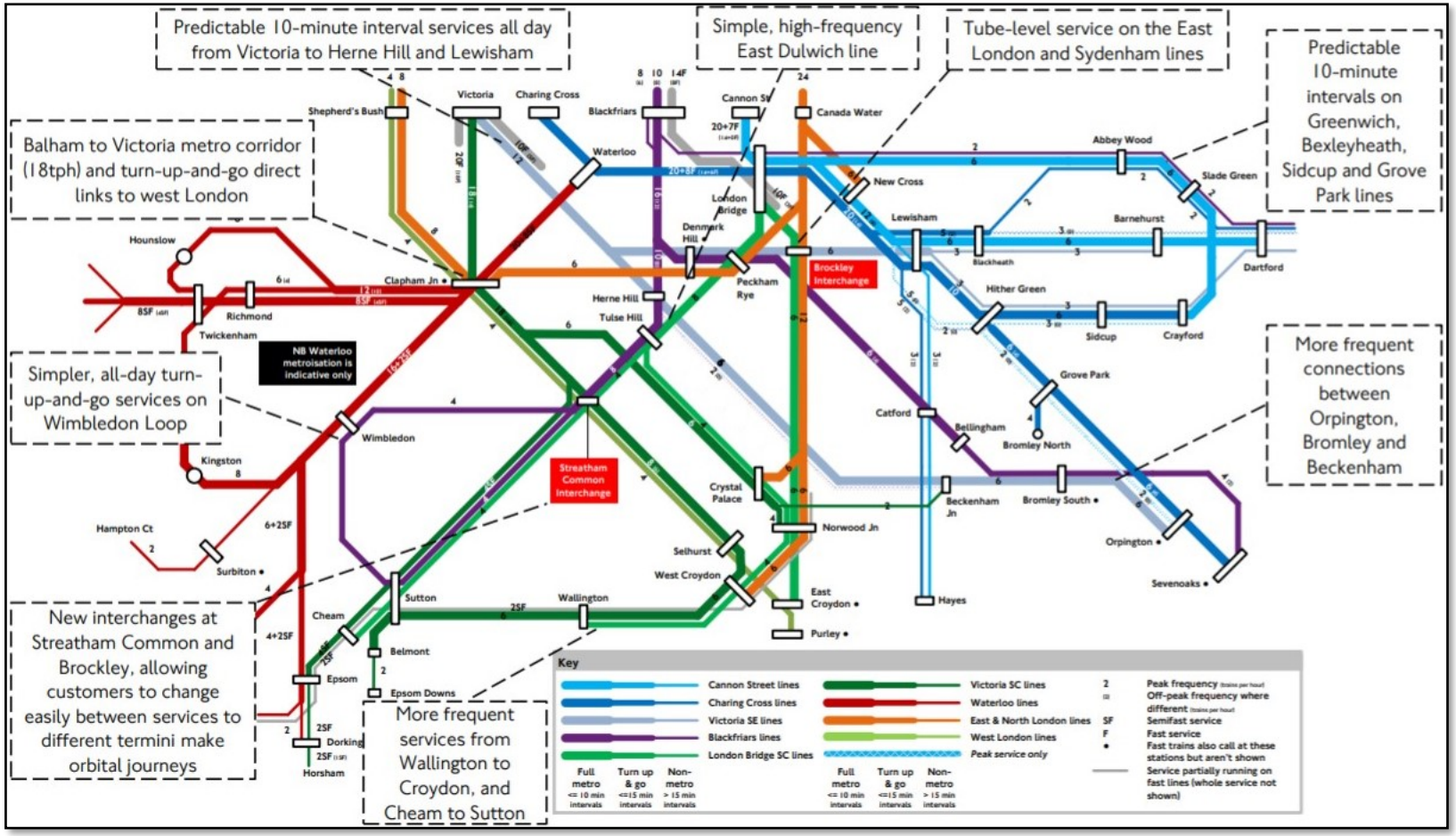



*Figure 25: Map showing TfL's Metroisation concept*

In total, Metroisation could deliver an additional 39 trains during the peak hour, as well as significantly increasing off-peak frequencies to more closely match the peak frequencies seen in 2019.

Increasing frequencies in the peak and off-peak is not without its challenges, particularly when considering off-peak freight services and the value of 'white space' to recover services after an intensely operated peak.

TfL suggest a toolkit which sets out the approach for operating an enhanced Metro service, and this is shown in table 3, as well as suggesting infrastructure enhancements which are described on page 32.

TfL Metroisation is not the same as devolution of rail services, although that is one such method TfL have identified in order to deliver improved services in South London. In this study, TfL Metroisation refers only to the rail service specifications.

*Table 3: The toolkit TfL propose to successfully operate Metroisation (TfL)*

| Category | Tool |
|---|---|
| **Service design** | Even intervals between services |
| | Simpler service patterns |
| | 'Every second counts' service planning approach i.e. using to-the-second timetabling, with detailed analysis of performance data, to drive constant incremental improvements in run and dwell times |
| **Contract design** | Performance incentives |
| **Staff & platform management** | Robust platform train despatch process |
| | Driver 'stepping back' at terminals |
| **Rolling stock design** | Reduced step and gap between train and platform |
| | More free-flowing train interior layout |
| | Increased number and width of train doors |
| | All train lengths using their route's full capability |
| | Improved train acceleration & braking performance |
| | Shorter train door cycle times |
| **Capital interventions** | Introduction of digital signalling |
| | Investment in bottleneck relief schemes |

# South London Baseline Review

## TfL Metroisation

### TfL identified infrastructure changes

**Grade Separation**

Key to delivering the intense level of service, removing constraints of some flat junctions is essential. This includes the Croydon area, Balham Junction and Falcon Junction at Clapham Junction .

**Turnback provision**

New turnback facilities and/or platforms at Wallington, Cheam, Cannon Street, Dartford and Belmont are also proposed to increase capacity and allow services to terminate reliably.

**Junction remodelling**

Smaller scale junction remodelling is proposed at Crystal Palace, Tulse Hill, Norwood Junction and West Norwood to accommodate the proposed level of service.

**Digital Signalling**

Automatic Train Operation could permit intense frequencies on key corridors and TfL propose these between Balham and Victoria, on the Sydenham Corridor, the East London Line and between the London Bridge approach and Charing Cross/Cannon Street.

Future signalling should not only deliver additional capability, but also improved resilience. 'To the second' timetabling is likely to require accuracy of 10/15 seconds as an initial step.

**New stations**

New interchange stations are proposed at Brockley and Streatham, seizing connectivity opportunities provided by increased frequencies. Under Metroisation the Norbury route would lose its direct service to Streatham and Tulse Hill but a new 'Streatham Interchange' would help to minimise the impact.

**Additional tracks**

As a result of increasing frequencies on the Chatham Mainline, Metroisation proposes loops between Kent House and Penge East to allow Mainline services to overtake Metro services. Additionally, to increase frequencies between Sutton and Belmont, the single Line would need to be enhanced.

A link to TfL's 'Strategic Case for Metroisation' can be found HERE


### Relation to the South London & Thameslink Study

**Service & Vision** - The South London & Thameslink Study shares a similar vision to TfL Metroisation—that services deliver enhanced capacity, reliability and connectivity. The approach this study takes is bottom-up. As explored in the following chapter, this study uses demand forecasts and evolves the Dec-19 service to generate example future service scenarios. TfL Metroisation represents a top-down end-state vision, in a way treating the network as a blank canvas. The future scenarios identified in this study provide a line of sight to 2050, and come very near to TfL's vision of Metroisation.

Assumptions around available terminal capability and infrastructure utilisation depend on specific service routing, signalling, technology, operational strategy and rolling stock; therefore some differences between this study's interpretation of infrastructure capability which may vary slightly from TfL Metroisation. Nevertheless, both this study and TfL Metroisation are complementary and help to set the scene for rail development in South London over the coming decades.

# 3

# Looking To The Future

- Demand modelling
- Vehicle gaps
- COVID impact
- Does COVID remove the crowding problem?
- Developing the ITSS
- The ITSS Example Scenarios
- Priorities logic
- Connectivity opportunities

# Looking to the Future

## Demand Modelling

### Methodology

To identify where crowding issues exist, and therefore identify where enhancements should be focused, a passenger demand model was developed.

This is based on TfL's multimodal RailPlan model to more accurately model the transport dynamics in London. The key inputs include: a growth rate building from a 2016 base, and housing growth potential, as identified in the London Plan. The demand model does not include aspirational targets for modal shift which could drive faster or greater growth.

Demand is forecast for key years: 2026, 2031, 2041, and 2050, and predicts how many passengers will travel between 2 neighbouring stations during the peak hour. This is modelled for both for 'inner' and 'outer' services which broadly reflect the Metro and Mainline service groups.

Figure 26 shows the crowding on South London Metro services in 2050 if the Dec-19 timetable continued to operate, but with maximum length and standardised Metro rolling stock on the network. This is under a medium post-COVID scenario.

Particular forecasted problem areas are the Greenwich Line, Hither Green to Lewisham, Wimbledon Loop, approaches to Blackfriars, Hackbridge Line to Clapham Junction, and the West and East London Lines.

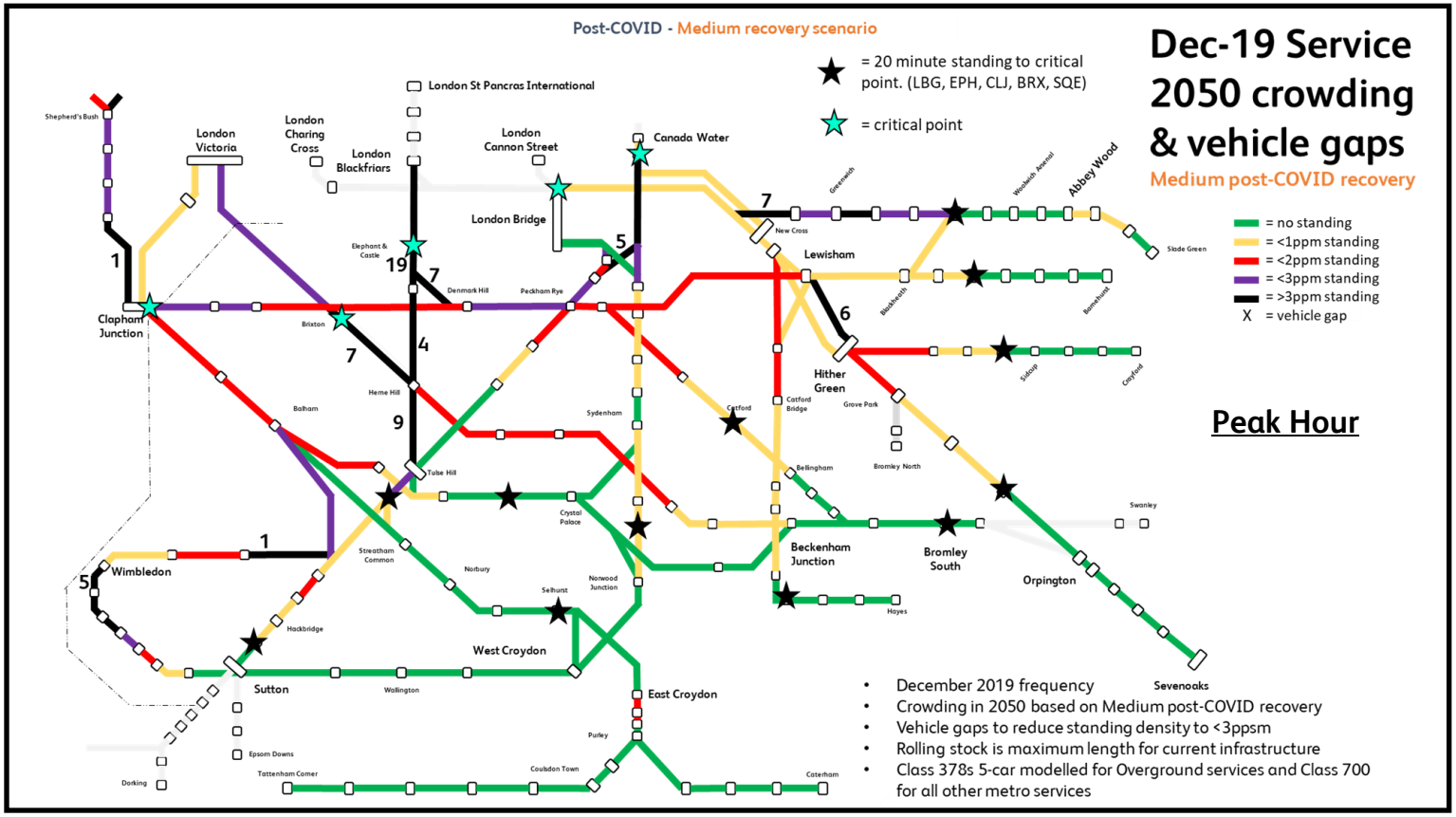



*Figure 26: Map showing standing density and vehicle gaps in 2050 with the Dec-19 service under Medium post-COVID scenario. This growth scenario multiplies the pre-COVID forecast by 83%.*

### The Target

This study has a target to **reduce standing density on Metro services to below 3 people per square metre (ppsm)**. Class 700 rolling stock can allow up to 4 passengers per square metre standing (ppsm), but class 465 rolling stock can only allow 2ppsm, and Class 376, 3ppsm (DfT). Therefore, as the model provides an average across the peak hour, targeting a maximum standing density, lower than Class 700s, but above current ageing rolling stock, allows for variation across the hour and gradual rolling stock enhancement. This is reasonable in the context of this high-level, long term, strategic study.

**Standing duration should also not exceed 20 minutes,** meaning for many Mainline services standing is not permissible. For Mainline services via East Croydon to London Bridge or Clapham Junction, or Bromley South to Victoria, some standing would be permittable only from these stations as journey times are below 20 minutes. Standing from beyond these stations would likely not be acceptable, depending on the critical load points.

In the future, the 3 ppsm target could be revised to better reflect post-pandemic travel patterns and requirements.

# Looking to the Future

## Vehicle Gaps

'Vehicle gaps' illustrate the number of additional carriages required to meet forecast crowding outcomes. A vehicle gap does not translate simply to additional rolling stock requirements as shown in figure 28.

To aid comparison and understand whether the capacity problem is caused by rolling stock length or frequency, it is beneficial to 'normalise' these data, using the maximum rolling stock length allowable on the route and a standard assumed future rolling stock style suited to each market.

In this study Thameslink style Class 700s for Metro routes and Class 375/377 for Mainline routes are assumed as standard.

The vehicle gap to 2050 is significant, and does not completely disappear under a low post-COVID scenario. This is illustrated in both figure 26, figure 27 and table 5

## COVID Impact

The impact of COVID on rail growth is still uncertain, but it is possible to provide examples of how growth could change. Both medium and low post-COVID scenarios have been explored, and multiply the pre-COVID forecasts by the percentages shown in table 4.

These are London specific COVID impact scenarios and therefore may differ from national projections. They are drawn from DfT's long term projections (Version 14). High post-COVID has not been explored as it is 97 % of pre-COVID forecast, and therefore has negligible difference in this level of study.

*Table 4: Post-COVID demand scenarios used in this study*

| Scenario | % of pre-COVID forecast |
|---|---|
| Pre-COVID | 100 % |
| Medium post-COVID | 83 % |
| Low post-COVID | 68 % |

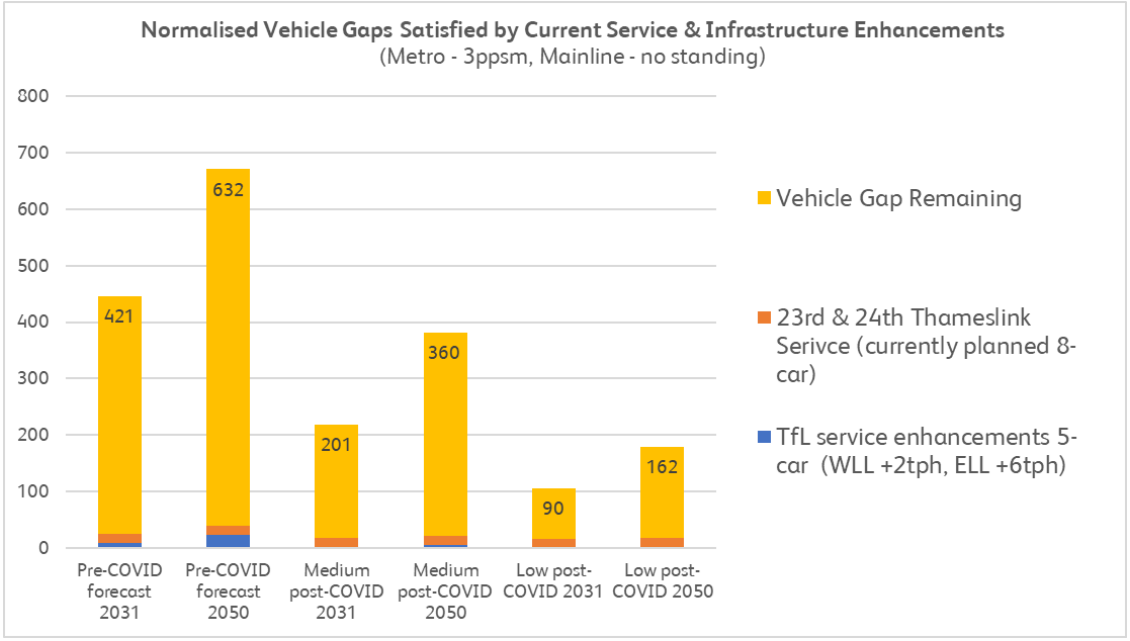



*Figure 27: Overview of 'vehicle gap' up to 2050 under different post-COVID recovery scenarios considering current proposals in development. 'Normalised' refers to standardised rolling stock (Class 700s on Metro, Class 377 on Mainline, maximum length for routes. 'PPSM' = People Per Square Metre.*

*Table 5: Total vehicle gaps for South London Metro and Mainline services*

| Future 'Normalised' Vehicle Gaps to Meet Target Crowding Outcomes - Aggregated Metro | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| COVID scenario | Dec-19 Base | | Pre COVID | | Medium | | Low | |
| Year | 2031 | 2050 | 2031 | 2050 | 2031 | 2050 | 2031 | 2050 |
| <2 standing passenger per m² | 207 | 323 | 181 | 265 | 80 | 143 | 16 | 53 |
| <3 standing passenger per m² | 101 | 165 | 69 | 131 | 13 | 45 | 0 | 5 |
| <4 standing passenger per m² | 46 | 88 | 15 | 50 | 0 | 5 | 0 | 0 |
| **Future Normalised Vehicle Gaps to Meet Target Crowding Outcomes - Aggregated Mainline** | | | | | | | | |
| COVID scenario | Dec-19 Base | | Pre COVID | | Medium | | Low | |
| Year | 2031 | 2050 | 2031 | 2050 | 2031 | 2050 | 2031 | 2050 |
| < 85% of seats occupied | 550 | 742 | 559 | 751 | 351 | 504 | 185 | 311 |
| < 100% of seats occupied | 370 | 530 | 377 | 540 | 206 | 337 | 106 | 174 |
| < 1 standing passenger per m² | 152 | 275 | 152 | 274 | 76 | 124 | 23 | 58 |
| < 2 standing passenger per m² | 53 | 112 | 66 | 112 | 13 | 48 | 0 | 0 |

*All unique critical load points on routes into terminals, East London Line and West London Line.*
*Dec-19 rolling stock and service shown as reference with pre-COVID forecast, then following column standardise rolling stock class and maximise length for route.*
*Normalised: Class 700 style generally for metro, with Class 378 (5-car) for TfL Overground services.*
*Normalised: Class 377 style generally for mainline, with Class 700 (12-car) for mainline Thameslink services*

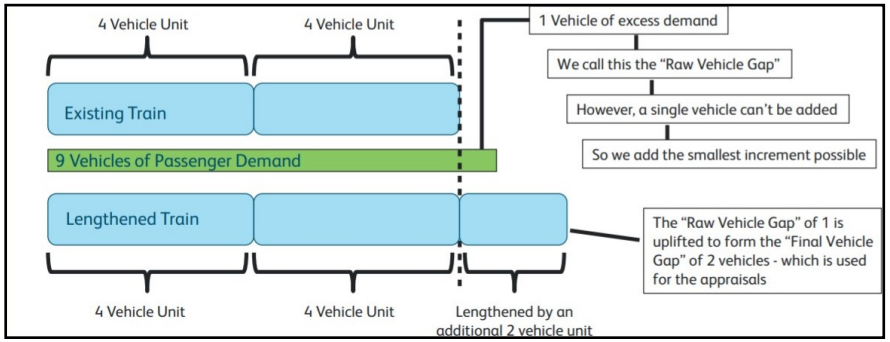



*Figure 28: Model showing vehicle gap relation to additional lengthening requirements*

# Looking to the Future

## Does COVID remove the crowding problem?

The COVID pandemic may have reduced passenger crowding drastically in the short term, but **crowding will still be a problem.** The 4 graphs below show how crowding could look in different post-COVID scenarios up to 2050 with the Dec-19 frequency, and with maximum length rolling stock for the routes.

Kent Mainline services could see standing from 2030s at the latest, or immediately post-COVID (low or medium post-COVID scenarios respectively). Standing is not permitted on these services and so they quickly reach full capacity.

In the low post-COVID scenario, from late 2020s, Sussex Mainline services will likely exceed 1.5 people per square metre standing into London Bridge, suggesting a requirement for the Croydon bottleneck to be relieved beyond this timeframe.

Under the medium post-COVID scenario, Blackfriars Metro services will likely exceed 3 people standing per square metre from the mid 2020s, requiring additional services. Similarly, on the Greenwich Line, standing will likely exceed 3ppsm from 2030s under the medium scenario even with full 12-car Class 700 rolling stock.

Crowding may therefore be pushed back a few years, but solutions in a network as complicated as London take time to develop and are not currently fully known.

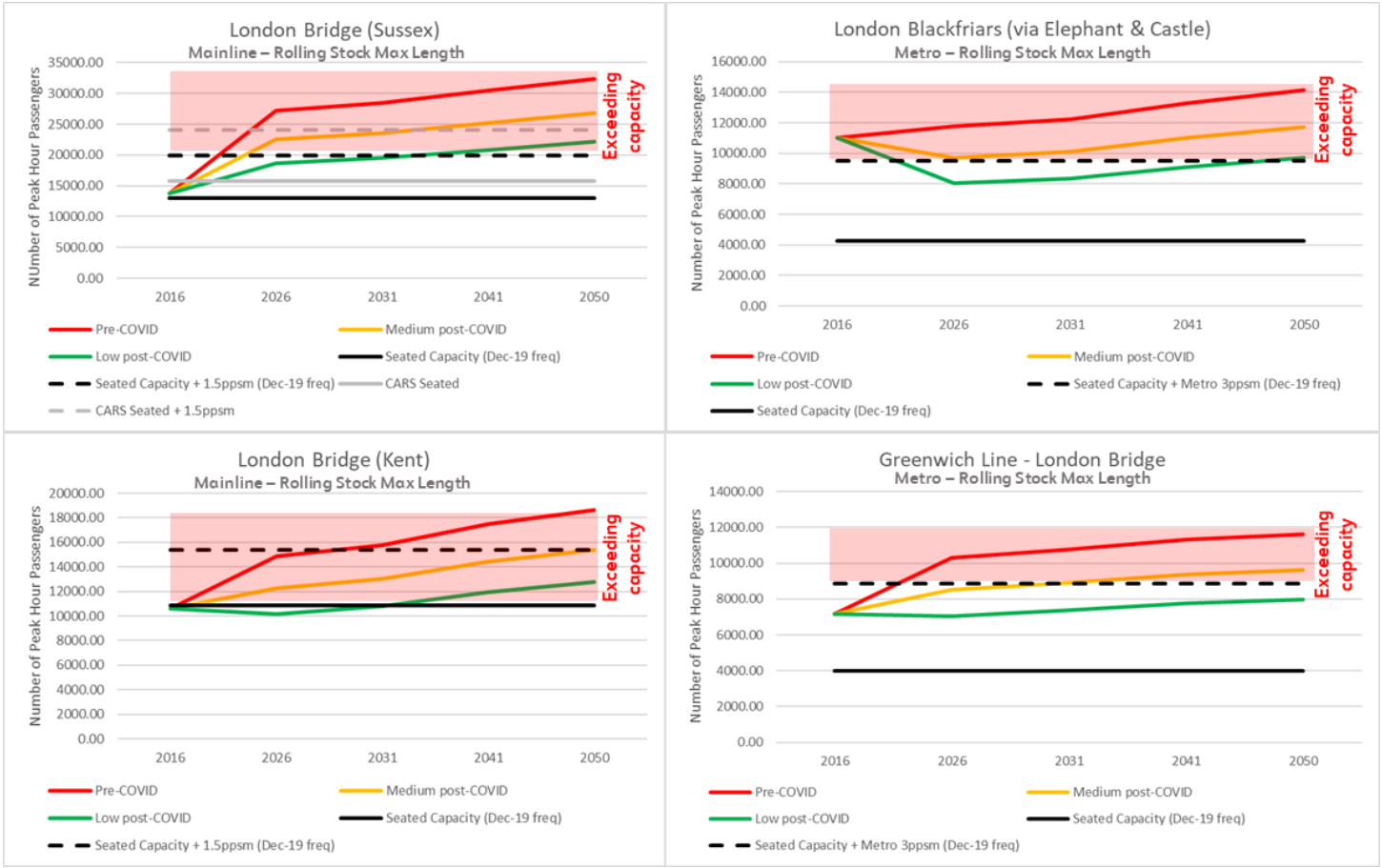



*Figure 29: Graphs showing how under post-COVID scenarios key routes in South London will suffer from crowding issues,*

**Investment is still necessary:**

By the 2040s, Sussex Mainline services will exceed 1.5-2ppsm under Low post-COVID recovery. As such, infrastructure enhancements, such as relieving the Croydon bottleneck remains a long term aim under all post-COVID scenarios,

Similarly, infrastructure solutions to improve London Bridge Area capability will likely be essential for the 2030s onwards under all COVID scenarios. Development of complicated projects, such as terminal expansion, take a significant amount of time, and currently, no developed solution exists. Therefore, a delay in development may have repercussions in the future.

Finally, additional services and new rolling stock will still be vital. This will also have further knock-on impacts to line of route capabilities and interactions with freight growth.

Infrastructure assets will still come up for renewal in the near-future, therefore when renewed they must protect medium-long term vision and not restrict rail growth. This will make enhancements more efficient.

# Looking to the Future

## Developing the ITSS

The location of the crowded sections and vehicle gaps identify where additional services should be provided. With a network as complicated as South London, there are numerous ways in which the vehicle gaps can be satisfied.

Different routing opportunities of services also can allow for multiple vehicle gaps to be satisfied, thereby reducing the total number of additional services required.

Combining these factors with an understanding of the current network constraints allows for multiple phased **Indicative Train Service Specifications (ITSS)** to be developed along with their high level infrastructure impacts. These are explored on the following pages.

Initially the ITSS was developed based on the minimum required uplift to meet crowding targets. This was then overlayed with some connectivity aspirations, which were: Brighton Mainline Upgrade long term train service outputs, TfL Overground aspirations, evening–out of service provision, and 4tph between Lewisham and Victoria.

**These ITSSs are not expected to be the exact future service.** They instead present a range of impacts on the network, from a 'Do Min' which has the least impact on infrastructure, up to a 'Do Max' which presents an 'ideal' should providing additional infrastructure not be a significant constraint. **TfL's Metroisation proposal could be understood as a 'Do Max+' ITSS scenario.**

Following infrastructure feasibility work, timetable analysis and economic analysis, the ITSS scenarios have been contextualised by identifying how challenging it will be to satisfy each. This has helped to identify the possible trade offs and dependencies within and between service provision and infrastructure intervention.

Due to the 3 ITSS scenarios and 3 post-COVID recovery scenarios, in total there are **9 possible future scenarios** to identify likely infrastructure and service requirements from.

*Table 6: Summary of ITSS options used to inform future service and infrastructure requirements*

| Scenario | Do Min ITSS (Peak) | Do Mid ITSS (Peak) | Do Max ITSS(Peak) |
|---|---|---|---|
| ***Overview*** | This includes maximising length of rolling stock, and then slightly reducing frequencies where possible, whilst still meeting crowding targets and maintaining acceptable levels of frequency (See page 46). Some *additional* services are provided away from London Bridge to Blackfriars or Victoria as these have capacity. Multiple vehicle gaps are satisfied by less additional services. Some Kent Metro services are lengthened and 'rationalised' to make most efficient use of infrastructure and reduce scale of service uplift. | Some *additional* services are operated away from London Bridge to Blackfriars or Victoria as in 'Do Min', but no service 'rationalisation' apart from the balance service patterns. | Duplication of existing services to meet vehicle gaps. Therefore this ITSS has the largest increase of services to London Bridge. This method is the least efficient in terms of use of infrastructure. |

**COVID Impacts:**

ITSSs have also been developed for medium and Low post-COVID scenarios and are shown in map form in the appendix. Total 'trains per hour' differences between the COVID scenarios are shown on page 38 in table 7. As the table shows, the changes in Mainline service are much greater than for Metro.

**Line of route appraisals:**

The demand data was broken down into 'station arcs' (i.e the link between two stations), which allowed for line of route appraisals with different post-COVID scenarios. Therefore, it is not a blanket approach to developing post-COVID ITSS scenarios, where the pre-COVID ITSS is just pushed back 10-20 years. Instead, bottom-up, new ITSS scenarios specific to the different expected demand were developed. Therefore, the ITSSs for pre-COVID and post-COVID are unique and distinct.

**TfL Overground Services:**

In all growth scenarios it is assumed that TfL introduce an additional 6tph on the East London Line which feed into the South London network, consisting of +2tph to Clapham Junction, +2tph to Crystal Palace, and +2tph to West Croydon. It is also assumed that an additional +2tph operate on West London Line from Clapham Junction through to Shepherd's Bush, which could be extended on to Willesden Junction and the North London Line.

# Looking to the Future

## The ITSS Example Scenarios

Table 7 shows how the number of additional services required in the 'Do Mid' ITSS scenario changes with different COVID impact scenarios. **The table does not include additional services to maximise the benefits of infrastructure schemes.**

As crowding was significant pre-COVID on the London Bridge routes, the medium post-COVID scenario does not have a significant impact on the need for additional capacity, whereas on the Victoria routes, where crowding was less significant, the impact is greater. Victoria is also impacted by lower growth than Blackfriars and London Bridge and therefore less necessity to divert services there.

These ITSS scenarios are examples and a framework to adapt and tweak as we learn more about the capability of the railway and feasibility of enhancement options for the future. For example, should London Bridge area enhancement opportunities be significantly constrained, an *additional* 2 Kent Mainline services into London Bridge may need to be diverted into Victoria.

In a low post-COVID scenario, the requirement for additional services to meet crowding pressures significantly reduces, although enhancements to improve connectivity and performance would still be beneficial to passengers and freight.

A high-post-COVID scenario is not explored as it has negligible differences against the pre-COVID scenario (high-growth impact is 97 % of pre-COVID forecasts).

The map shows what a pre-COVID 'Do Mid' ITSS scenario looks like in practice. Opportunity has also been taken to change the Kent routes to a 30 minute repeating pattern to make more optimum use of capacity.

*Table 7: Summary of net additional services required in the 'Do Mid' ITSS scenario*

| 'Do Mid' ITSS Scenario | | Pre-COVID recovery | | | | Medium Post-COVID recovery (83% of pre-COVID) | | | | Low Post-COVID recovery (68% of pre-COVID) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Minimum net additional services required to meet target crowding levels from Dec-19 service | | | | | | | | | | | |
| Terminal | Service | 2026 | 2031 | 2041 | 2050 | 2026 | 2031 | 2041 | 2050 | 2026 | 2031 | 2041 | 2050 |
| London Bridge | Kent Metro | 2 | 2 | 2 | 2 | - | 2 | 2 | 2 | - | - | - | - |
| | Kent Mainline | 3 | 5 | 5 | 7 | 3 | 3 | 5 | 5 | - | - | - | - |
| | Sussex Metro | - | - | - | - | - | - | - | - | - | - | - | - |
| | Sussex Mainline | 4 | 6 | 8 | 8 | 2 | 2 | 6 | 6 | - | - | 2 | 4 |
| | Total into LBG | 9 | 13 | 15 | 17 | 5 | 7 | 13 | 13 | - | - | 2 | 4 |
| Blackfriars (via Elephant & Castle) | Metro | 4 | 4 | 4 | 4 | 2 | 4 | 4 | 4 | - | - | - | 3 |
| London Victoria | Kent Metro | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 1 | 1 | 1 | 3 |
| | Kent Mainline | - | 1 | 3 | 3 | - | - | - | - | -1 | -1 | -1 | -1 |
| | Sussex Metro | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | - | - | - | - |
| | Sussex Mainline | - | 2 | 4 | 6 | - | - | 2 | 2 | - | - | - | - |
| | Total into VIC | 5 | 8 | 12 | 14 | 5 | 5 | 6 | 6 | - | - | - | 2 |
| Orbital | West London Line | 1 | 2 | 2 | 3 | - | - | - | 1 | - | - | - | - |
| | East London Line | 4 | 6 | 6 | 6 | 4 | 6 | 6 | 6 | - | - | - | 1 |

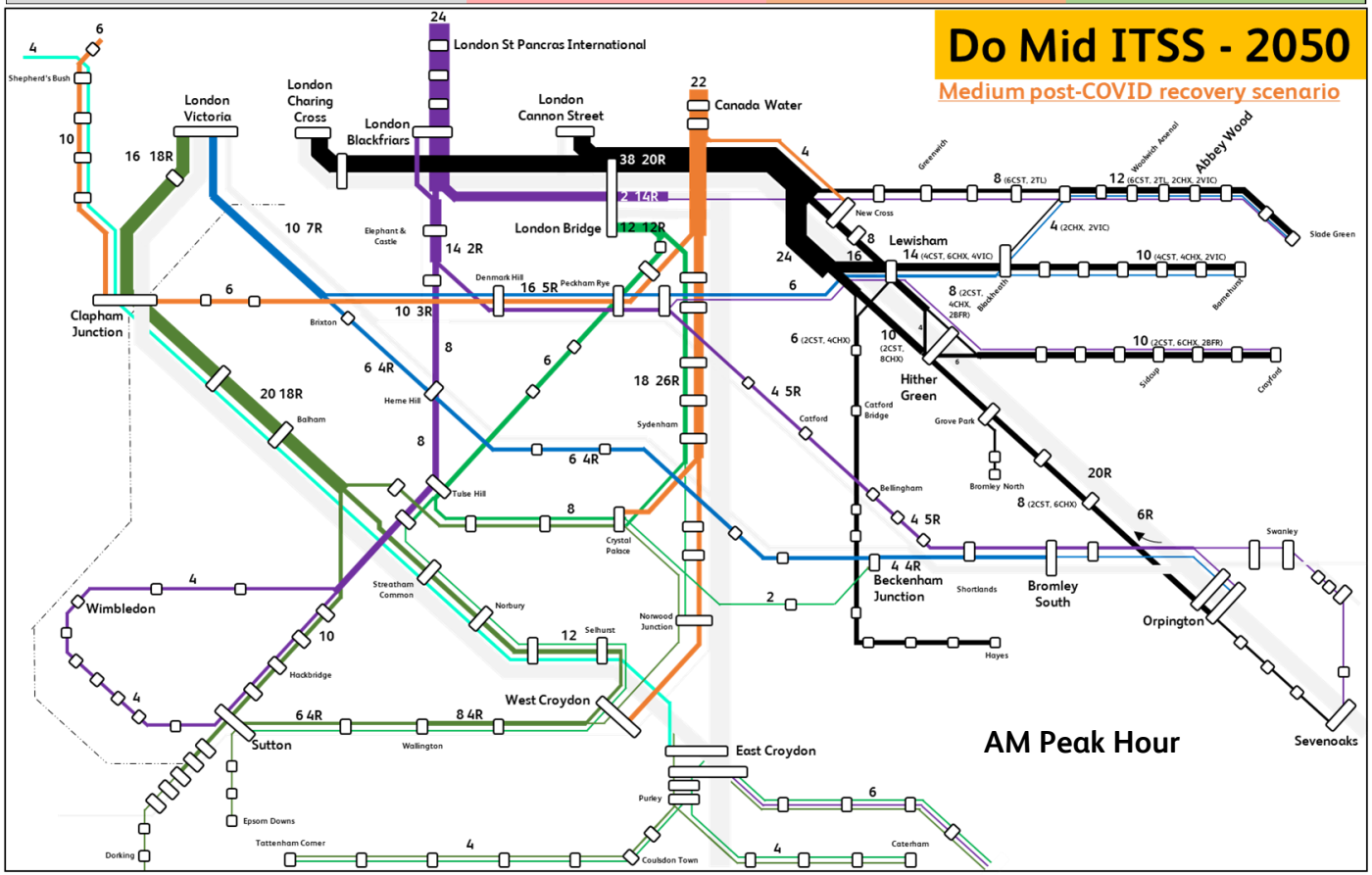



*Figure 30: Example ITSS scenario for the 'Do Mid' ITSS, with pre-COVID demand forecasts for 2050.*

# Looking to the Future

## The ITSS: Example Scenario

These graphs illustrate that **there is a strong relationship between growth, connectivity and required capacity.**

The graphs show the capability improvements that would likely be required at London Bridge and London Victoria under the 3 different ITSS scenarios, and 3 post-COVID recovery scenarios.

There is an assumption that within the Dec-19 timetable, 4 peak hour paths are available to use into London Bridge, 2 remain into London Victoria (Sussex side), 3 into London Victoria (Kent side), and 4 remain in Blackfriars bay platforms.

Pre-COVID, the ITSS scenarios resulted in London Bridge requiring additional capacity for between 9 and 17 trains per hour, but in a medium post-COVID scenario this reduces to between 5 and 9 trains per hour. The lower capacity requirements are due to altered connectivity.

For context, if the Bakerloo Line was extended to Hayes, this would release 6 paths into London Bridge, significantly catering for post COVID scenarios.

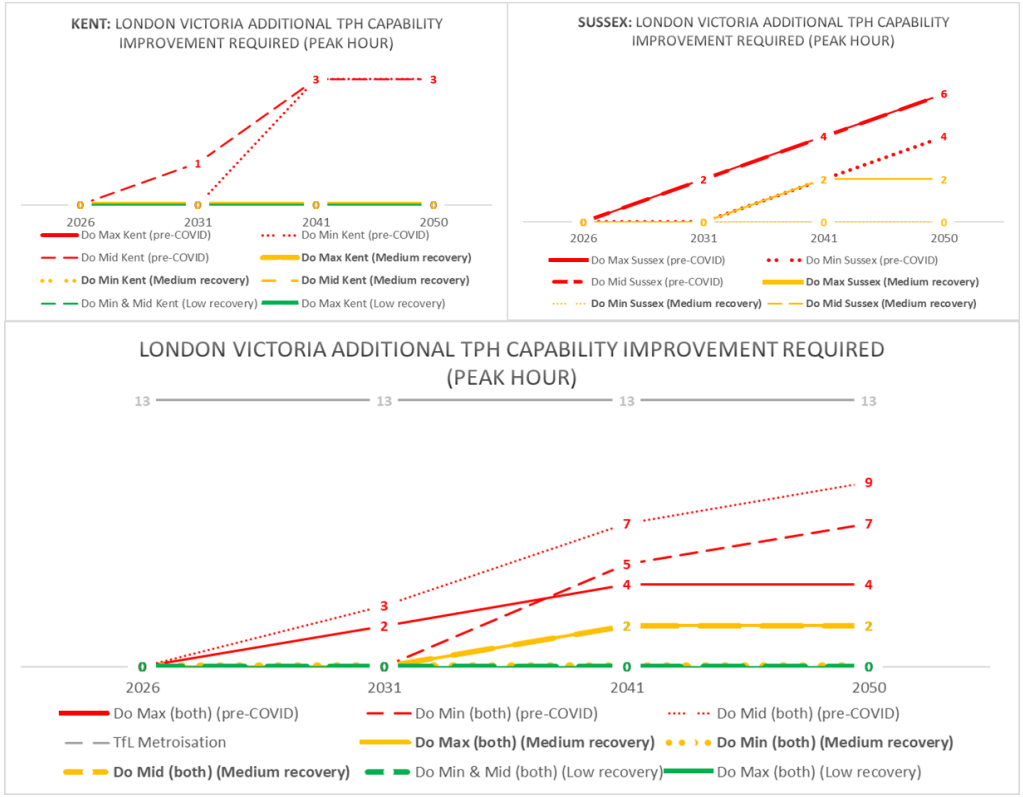



*Figure 31: Graph showing new capacity requirement at London Victoria under different ITSS and post-COVID scenarios demonstrating the pathway from the current infrastructure and service (bottom left), to a possible end state of TfL's Metroisation concept (top right). TfL Metroisation frequencies overlaid with the South London & Thameslink 'Do Max' Mainline uplift and standard timetable planning assumptions to provide comparison to other ITSS scenarios identified in this study.*

**All Dec-19 service and future ITSS maps shown in the appendix**

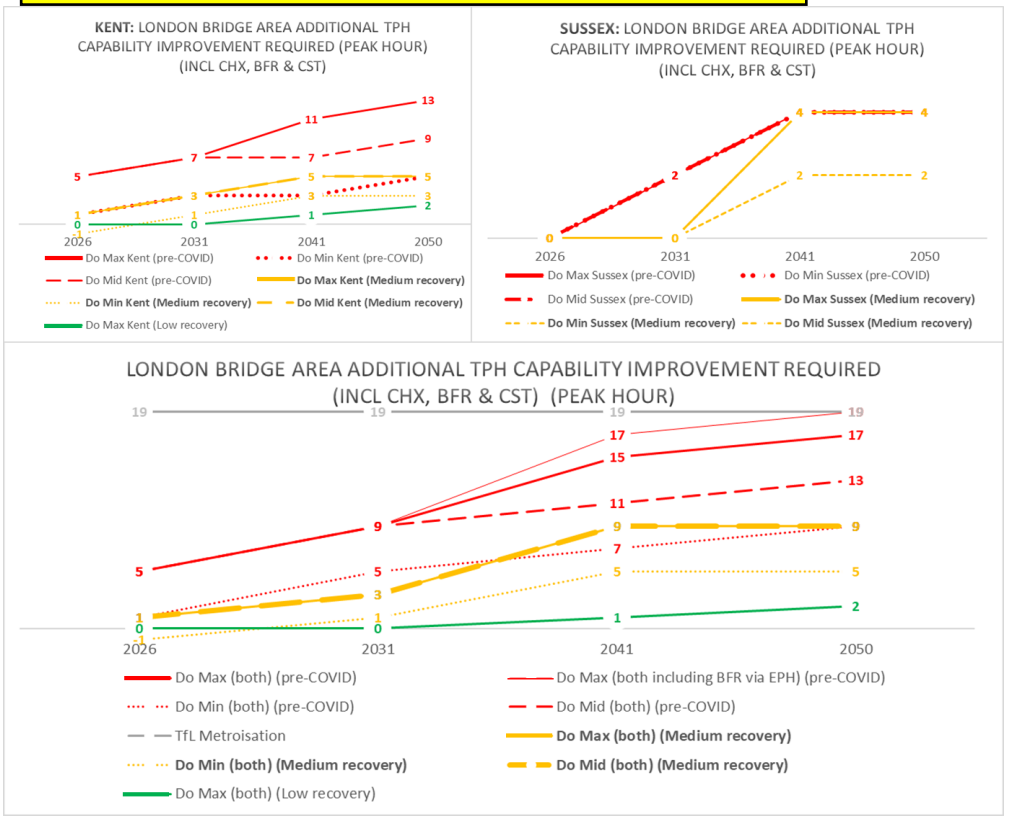



*Figure 32: Graph showing new capacity requirement at London Bridge under different ITSS and post-COVID scenarios demonstrating the pathway from the current infrastructure and service (bottom left), to a possible end state of TfL's Metroisation concept (top right). TfL Metroisation frequencies overlaid with the South London & Thameslink 'Do Max' Mainline uplift and standard timetable planning assumptions to provide comparison to other ITSS scenarios identified in this study.*

Compared to London Bridge, London Victoria is more impacted by the 'Do Min' and 'Do Mid' ITSS scenarios. In the 'Do Min' and 'Do Mid' ITSS scenarios some new services required to meet demand to London Bridge and Blackfriars are instead operated to London Victoria. This reduces the pressure on capability improvements at the more constrained London Bridge and Blackfriars.

It is also evident from the London Bridge graph that the 'Do Max' ITSS scenario almost acts as a pathway to TfL's Metroisation proposal.

Operating to Victoria would mean that additional infrastructure would not need to be provided into London Bridge and Blackfriars ('Do Max ITSS). Instead, increased crowding would likely need to be accepted on services, reducing the number of additional Metro services, thereby reducing the capability improvement required.

As demand post-COVID becomes clearer, and the opportunity for capability improvement is further explored, the necessity for additional service diversion will become more evident.

# Looking to the Future

## The ITSS: Example Scenario

ITSS scenarios have also explored impacts on key constraints on the network, namely Herne Hill, Lewisham and Balham junctions. Herne Hill and Lewisham are shown here as examples. These graphs show the number of 'line crossings' a service makes, meaning each time a service crosses another track, which can be multiple times for one service. This illustrates the impact the service has in affected occupancy at the junction.

### Herne Hill

Prior to 2018, Herne Hill saw 4 more trains per hour crossing (As Thameslink services to Brighton had to go via Herne Hill), which resulted in there being 16 more line crossings than are seen in the Dec-19 timetable. As figure 32 shows, in a medium post-COVID recovery scenario, generally the number of line crossings would increase to the region of what occurred pre-2018; 12-20 additional line crossings.

Pre-COVID growth required a number of services that push the quantum of line crossings much higher, in the region of an additional 24-28 crossings. It is likely that this level of operation is only acceptable with much higher service reliability or a capacity enhancement.

The detail surrounding the service options for Herne Hill is explored on pages 51 to 53.

### Lewisham

Lewisham on the other hand could see a reduction in line crossings in all ITSS scenarios, aligning to TfL's 'Metroisation' proposal.

This study is **not proposing that any line loses its connectivity to the terminals** it is currently connected to, but instead the routing and ratio is evolved to meet the necessary crowding outcome required. **This results in increased capacity, but reduced junction crossings** as routing is simplified.

Numerous routing opportunities exist at Lewisham, but have less impact on the final destination. For example, conflicts in theory can be fully removed at Lewisham Crossover Junction, but all services can still serve London Bridge.

The ITSS scenarios illustrate that it is possible to increase capacity on the Kent Metro area through Lewisham, without increasing conflicting moves at the junction. The main limitation would be platform throughput.

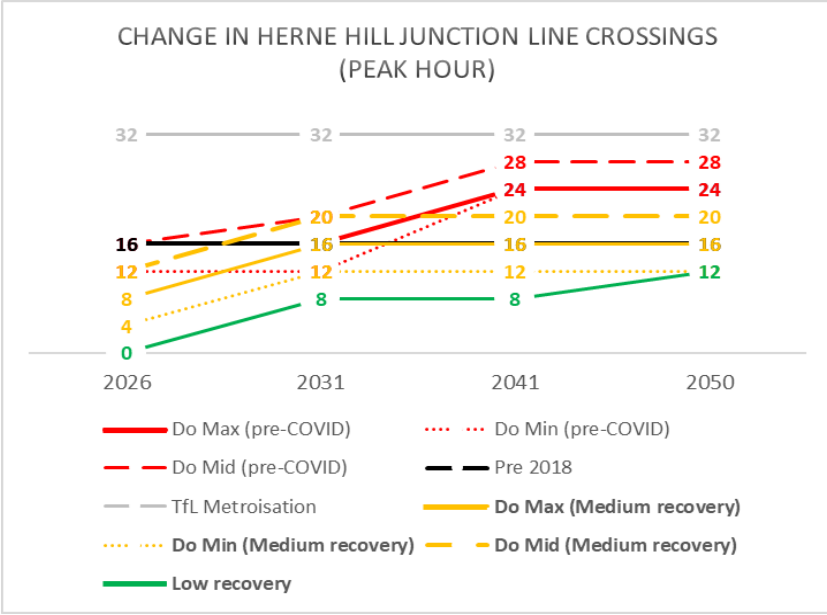




*Figure 33: Change in line crossings at Herne Hill under different ITSS and post-COVID scenarios.*

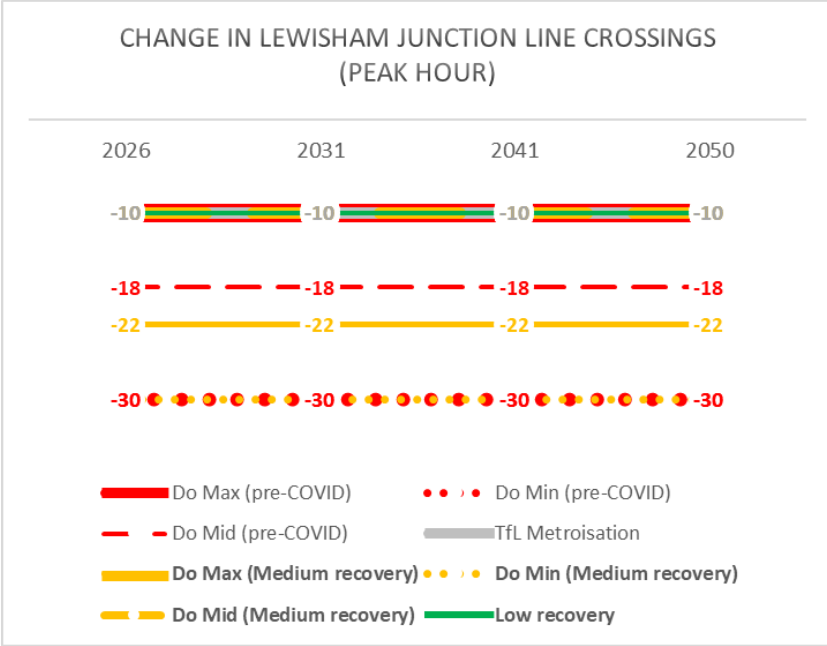



*Figure 34: Change in line crossings at Lewisham under different ITSS and post-COVID scenarios.*

# Looking to the Future

## The ITSS: Example Scenario

### Intervention Logic

Whilst the ITSS scenarios vary widely, they all are impacted by the same constraints. The difference is that each scenario requires each constraint to be solved to a slightly different degree. The constraint deemed one of the most pivotal is London Bridge area capability. Depending on what is possible there, other infrastructure constraints may increase or decrease in their significance.

**Priority 1: Small, flexible constraints**

Before any new rolling stock or infrastructure is enhanced, the first priority is to see whether small timetable changes can solve the issue. Can an additional stop be added into a service, or a certain stop removed to reduce crowding? Can the routing of a service change to avoid a conflict? Can the timetable be amended to support improved performance? These are all examples of small changes Train Operating Companies do on a regular basis to optimise their service offering.

This could also include services adapting to post-COVID markets, with the ratio of Metro and Mainline services evolving so as to be efficient with current infrastructure.

**Priority 2: Rolling stock capacity constraints**

Then, small enhancements can be considered. Can services be formed of more carriages, particularly where there are no infrastructure constraints? If platforms do need to be extended, can these be done relatively affordably? Can new rolling stock be procured which is better suited for the market (i.e more standing area for Metro journeys)?

Following this stage, all tactical opportunities should have been seized and rolling stock should be maximum length for the route.

**Priority 3: Infrastructure constraints**

Then, the key infrastructure constraints will need to be addressed. In the case of Sussex services, the largest constraint is the Croydon area, which would need to be relieved/enhanced to allow any additional Mainline services into London from the Brighton Mainline.

On the Kent side, terminals are one of the primary constraints, which leads on to priority

**Priority 4: Terminal capability constraints**

Then, terminals become the primary constraint. Whilst the wider network may be able to handle more services, it is unlikely that they will be able to terminate at a London terminal due to lack of capacity. Therefore, this is the next key constraint that requires options for development. A project is underway identifying opportunities to enhance the capability of London Victoria which will support the future capability of the network in South London and the South East.

**Priority 5: Line of route constraints**

Then, once new terminal capability is identified and constructed where possible, and remaining capability utilised on the wider network, further options will be necessary. In developing the ITSS scenarios, locations identified that start to suffer from limited capability, or become a significant constraint on the network, are shown to the right.

In some cases improved signalling will be sufficient to reduce headways and improve performance, allowing increased frequencies. In other cases, an additional platform may be required, or improved track layout, or a change in the routing of services. For some, more significant infrastructure may be required, such as 'grade separation' of junctions.

- Herne Hill Junction
- Wimbledon Loop constraints
- Hither Green to London Bridge
- Bromley South to Victoria
- Balham Junction to Clapham Junction
- Orbital routes (West London Line & South London Line)
- St Mary Cray Junction
- Sydenham Corridor
- South East Mainline
- Platform lengths
- Power supply

**In reality…** the process is not as linear or as simple as this, and the order can change depending on the specific route in question. As projects are developed they consider their future impacts and constraints. If feasible, it may be possible to incorporate longer-term changes into earlier phases to reduce the amount of disruption to passengers, save development costs, and deliver benefits sooner. Alternatively, multiple constraints can occur at the same time, where there is both limited terminal capability and wider line of route constraints. A 'programme' approach is required for scheme development.

# Looking to the Future

## Connectivity Opportunities

### Orbital Connectivity

Links between the Sussex Metro area and Kent Metro area are currently poor. Whilst new direct service opportunities are relatively limited, an opportunity does exist to enhance frequencies between Lewisham and Victoria, via the South London Line, and potentially call at Clapham High Street to improve local connectivity and connect to the Northern Line. High level platforms at Brockley would also permit this service to connect with Sydenham Corridor London Overground and Southern services to improve Sussex and Kent Metro connectivity.

Providing an additional 2tph between the West London Line to the Sussex Metro network presents an opportunity to operate a new service between the West London Line and Beckenham Junction, providing direct connectivity from the Kent network to Clapham Junction, Shepherd's Bush, the West Coast Mainline, and possibly HS2. Due to the required infrastructure enhancements on West London Line and between Clapham Junction—Balham Junction, and conflicts with increased freight and TfL Overground services, this is a long term aspiration.

Additionally, improving interchange at stations such as Lewisham, Peckham Rye, and Hither Green could also help to encourage more orbital journeys to be taken by rail.

### Last services

As shown on page 24, Sussex Metro services generally finish 30 minutes to 1 hour prior to the end-of-service on the Kent Metro routes. As part of a scheduled timetable change, or new franchise / concession, there could be the opportunity to specify later services.

Should earlier or later services be desired for certain stations, a review of the Engineering Access Statement (the time allotted for work on the infrastructure to take place) would be required, along with economic and operational appraisal of the benefits in operating the additional services.

### New stations / new station calls

In addition to calling the Lewisham-Victoria services at Clapham High Street, and potential for high level platforms at Brockley, another new station opportunity includes Camberwell. A new station serving Camberwell would offer much faster local connectivity, and reduce the pressure on local roads.

These proposals are explored in more detail on pages 79, 80 and 81.

### Journey Time Improvements

It is unlikely that orbital journey times can be vastly improved by new direct services, apart from those referred to in the 'orbital connectivity' box. Focusing on efficient station interchanges, and fast journey times to these interchanges will help to drive orbital journey times down.

This will also help with radial journey times. For example, there is the opportunity to reduce journey times from Sutton to London Victoria and London Bridge. Similarly, journey times from Dartford to London Bridge could be quicker by having more limited stop services. This would require new services, and enhanced infrastructure, such as signalling headways and terminal capability.

However, the fastest journey times can come at the expense of service intervals for intermediate stations, as slow services are squeezed together to allow fast services to have a clear run. Economic appraisal of the different options and trade offs must be considered to fully understand whether the positives of faster journey times outweigh the negatives.

### Frequency Improvements

As identified on page 25, the Wimbledon Loop in particular suffers from comparably poor frequencies, being so close to central London and having so many stations with 2tph. Providing 4tph in both directions around the Loop is a key recommendation from this study. Ideally this service would ideally operate with even intervals and all to Blackfriars, but in the short term uneven intervals and a split between Blackfriars and London Bridge may be necessary.

LB Sutton is proposing to enhance frequencies on the Epsom Downs branch as far as Belmont to support the development of the London Cancer Hub. This would increase frequencies from 2tph to at least 4tph, and potentially 6tph in the longer term.

# 4

# The Strategy
# Lines of Route & Terminals

- London Bridge (Sussex) - Metro
- London Bridge (Sussex) - Mainline
- London Bridge (Kent) - Metro
- London Bridge (Kent) - Mainline
- London Victoria (Sussex) - Metro
- London Victoria (Sussex) - Mainline
- London Victoria (Kent) - Chatham Mainline
- Wimbledon Loop
- South London Line & Catford Loop
- West London Line
- Summary of potential enhancements

**All Dec-19 service and future ITSS maps shown in the appendix**

# The Strategy: Lines of route & terminals

## London Bridge (Sussex) - Metro

**Lengthening or frequency?** Services via Tulse Hill were 8-car, and 10-car via the Sydenham Corridor in Dec 19.

The London Bridge Metro services are not forecast to require lengthening beyond 8-car to manage crowding in all COVID scenarios. Rolling stock should be optimised with Class 700 style interior and capacity.

Additional capacity between the Wimbledon Loop and Blackfriars would relieve the flow via Tulse Hill to London Bridge.

*Table 8: Vehicle gap for route*

| | Pre COVID | | Medium | | Low | |
|---|---|---|---|---|---|---|
| **New Cross Gate - London Bridge** | **2031** | **2050** | **2031** | **2050** | **2031** | **2050** |
| **<2 standing passenger per m²** | 0 | 0 | 0 | 0 | 0 | 0 |
| **<3 standing passenger per m²** | 0 | 0 | 0 | 0 | 0 | 0 |
| **<4 standing passenger per m²** | 0 | 0 | 0 | 0 | 0 | 0 |
| Class 700, 10-car, Dec-19 service | | | | | | |
| **South Bermondsey - London Bridge** | **2031** | **2050** | **2031** | **2050** | **2031** | **2050** |
| **<2 standing passenger per m²** | 6 | 15 | 0 | 5 | 0 | 0 |
| **<3 standing passenger per m²** | 0 | 4 | 0 | 0 | 0 | 0 |
| **<4 standing passenger per m²** | 0 | 0 | 0 | 0 | 0 | 0 |
| Class 700, 8-car, Dec-19 service | | | | | | |
| **New Cross Gate - Surrey Quays** | **2031** | **2050** | **2031** | **2050** | **2031** | **2050** |
| **<2 standing passenger per m²** | 10 | 15 | 2 | 6 | 0 | 0 |
| **<3 standing passenger per m²** | 0 | 4 | 0 | 0 | 0 | 0 |
| **<4 standing passenger per m²** | 0 | 0 | 0 | 0 | 0 | 0 |
| TfL Overground - Class 378, Dec-19 service | | | | | | |

### Service Enhancement Options

Metro frequencies into London Bridge via Tulse Hill (6tph) and Sydenham Corridor (6tph) to London Bridge do likely not require increasing to accommodate future demand.

**Tulse Hill Line:** Should it be feasible to operate all current and future Wimbledon Loop services to Blackfriars, the current 2tph London Bridge-Wimbledon Loop peak-only service could be diverted via Tulse Hill to Crystal Palace or the Norbury route instead, providing enhanced connectivity and capacity. This would likely relieve the small vehicle gap into London Bridge in 2050

**Sydenham Corridor:** London Overground frequency enhancements (+2tph to Crystal Palace and +2tph to West Croydon) on the Sydenham Corridor would likely provide sufficient capacity for long term growth (Pre-COVID). This would result in the Sydenham Corridor seeing 18 Metro services in the peak hour.

**West Croydon Interface:** Relief of the Croydon area bottleneck and a turnback, potentially at Wallington or on the Epsom Downs branch, are likely required for additional services to West Croydon over Dec 19 levels. This may require some current services terminating at West Croydon to be extended to the new turnback to increase capacity. Any extended services could also call at Waddon to support planned developments in the area.

It is expected that this should provide sufficient capacity for additional West Croydon services, meaning likely no essential infrastructure changes are required at West Croydon. However, there could be opportunity to increase the operational flexibility at West Croydon, such as moving the terminating platforms to the centre or providing additional platforms. Depending on the specific design, this could potentially require the widening of the London Road bridge. This would be subject to further development work.

**Post-COVID:** Overground enhancements are likely to still be beneficial with lower growth as they drive improved connectivity. Plus, the average crowding may mask higher crowding on the Overground services, so capacity issues may remain with medium post-COVID recovery.

**Improved Connectivity:** After relieving the Croydon bottleneck, there is the opportunity to operate additional Metro services to East Croydon to enhance local connectivity, which could include:

1) Extending the London Bridge—Norwood Junction service; or
2) An additional 2tph from the West London Line to either East Croydon (or Beckenham Junction) following West London Line capability improvements.

**New Cross Gate:** There is also the opportunity that, should the Bakerloo Line be extended to Lewisham, an additional platform at New Cross Gate could be constructed to allow semi-fast London Bridge services to call, providing a strategic interchange. This is likely dependent on the Bakerloo Line Extension due to the extra platform requiring additional land requirements adjacent to the station. This land would likely be initially used for Bakerloo Line Extension construction.

### Potential Infrastructure & Rolling Stock Enhancements

*(Letters allow cross-referencing with other ITSS pages & table on page 59)*

- **A: New rolling stock:** Standard Class 700 style rolling stock on Metro routes would be essential to minimise crowding with the current infrastructure. Overground could remain with Class 378/710 style stock.
- **B: Croydon Area Bottleneck Relief:** Recommended to allow any increase in frequency to West Croydon.
- **C: Turnback Opportunities:** Required on Wallington Line for enhanced TfL Overground service.
- **D: Sydenham Corridor headway reduction:** To operate 18tph on Sydenham Corridor, the route is a candidate for headway deduction and potentially digital signalling to improve performance.
- **E: Wider Sussex Metro route enhancements including West London Line and Clapham Junction—Balham Junction capability improvement:** Combination of interventions L, R, S, and B depending on service introduction phasing and routing.

*Table 9: Future likely required service changes with the various ITSS and post-COVID recovery scenarios.*

| | | Accumulate services along the row → | | | |
|---|---|---|---|---|---|
| | **Growth scenario** | **2026** | **2031** | **2041** | **2050** |
| Rows independent of each other | **Pre-COVID METRO** | **+2tph East London Line—Crystal Palace** | ***+2tph Watford Jn—West London Line—Clapham Jn—East Croydon/Beckenham Jn (Do Mid & Max) (E)*** ***(refer to page 58 for more detail on requirements)*** | ***+2tph East London Line—West Croydon*** (B, C, D) (VIC-WCY extended to WLT) (B) (Redirected LBG-WIM Loop path to CYP/NRB) | ***2tph Watford Jn—West London Line—Clapham Jn—East Croydon/Beckenham Jn (Do Min) (E) (refer to page 58 for more detail on requirements)*** |
| | **Medium & low post-COVID METRO** | ***+2tph East London Line—Crystal Palace*** | ***+2tph Watford Jn—East Croydon/ Beckenham Jn (Do Mid & Max) (E)*** ***(refer to page 58 for more detail on requirements)*** | ***+2tph East London Line—West Croydon*** (B, C, D) (VIC-WCY extended to WLT) (B) | ***+2tph Watford Jn—East Croydon/ Beckenham Jn (Do Min & Low post-COVID) (E) (refer to page 58 for more detail on requirements)*** |

**Bold**—required for capacity, *Italics*— Connectivity opportunities, ()—knock on / related service changes

# The Strategy: Lines of route & terminals

## London Bridge (Sussex) - Mainline

**Lengthening or frequency?** Non-12-car route is Epsom via West Croydon. Lengthening all to 12-car would provide around an extra 12 vehicles, reducing the need for 1 additional service in to London Bridge. This would not be enough to eliminate the need for additional services into or even remove a service pair.

With rolling stock operating the maximum length for the infrastructure, up to 8-10 additional services per peak hour are likely required between East and West Croydon and London Bridge to reduce standing density to below 2ppsm by2050 (allows for some standing from East Croydon only). The priority is therefore to provide a higher frequency services.

*Table 10: Vehicle gap for route*

| Sussex Outers to London Bridge | Pre COVID 2031 | Pre COVID 2050 | Medium 2031 | Medium 2050 | Low 2031 | Low 2050 |
|---|---|---|---|---|---|---|
| < 85% of seats occupied | 338 | 413 | 242 | 305 | 163 | 215 |
| < 100% of seats occupied | 255 | 319 | 173 | 227 | 106 | 150 |
| < 1 standing passenger per m² | 140 | 190 | 76 | 118 | 23 | 58 |
| < 2 standing passenger per m² | 66 | 107 | 13 | 48 | 0 | 0 |

*Class 700 rolling stock for Thameslink services, Class 377 for non-Thameslink. Mainly 12-car, some exceptions (Uckfield, Epsom) Dec-19 service

### Service Enhancement Options

**Definition**: 'Mainline services' refers to fast services between East Croydon and London. It identifies the likely required services to reduce crowding. **This does not cover the strategy for all Mainline services across Sussex.**

**Sydenham Corridor:** +10tph in to London Bridge by 2050 to reduce standing from East Croydon to below 2ppsm. This would result in 30tph along the Sydenham Corridor (Mainlines), severely pushing the capability of even enhanced infrastructure.

**More to Victoria:** Providing substantially improved Mainline frequencies to Victoria (+6tph) could attract some passengers away from London Bridge, allowing London Bridge services to increase by +8tph, not +10tph.

**Service Routing:** Of these +8tph, +2tph could route via West Croydon to provide 4tph fast services to Sutton and Epsom, whilst the remaining +6 could route via East Croydon.

**Croydon Area Bottleneck Relief:** Any increase in peak Sussex Mainline services requires the Croydon bottleneck to be relieved—likely by grade separation and an enhanced East Croydon station.

Whilst additional Mainline services may be required to meet higher 2026 & 2031 demand, they be unable to operate until the infrastructure is enhanced.

Any increase beyond the +4tph to London Bridge will require London Bridge area capability improvements and enhanced signalling on the Sydenham Corridor. As this study identifies a 2050 need for a total of +8tph, capability would be required for a further +4tph above current London Bridge Sussex capacity.

**Post-COVID:** +4tph could be needed in a low-growth scenario by 2050, but with the medium post-COVID scenario a further +2tph are required (requiring London Bridge capability improvements).

**Potential Infrastructure & Rolling Stock Enhancements**

*(Letters allow cross-referencing with other ITSS pages & table on page 59)*

- **B: Croydon Area Bottleneck Relief:** Recommended to allow any increase in frequency to West or East Croydon.
- **F: London Bridge Area capability improvement:** After +4tph into the Sussex side, no spare capability remains at London Bridge without enhancement.
- **D: Sydenham Corridor & Wallington Line headway reduction:** Pushing services up to 28-30tph on the Sydenham Corridor would require very reliable operation of services and shortest headways possible. Digital signalling, and potentially Automatic Train Operation in the longer term would be likely be required to deliver this. Headways on the West Croydon—Sutton route would also benefit from shortening to accommodate additional fast services and improve reliability.
- **G: Wider route interventions:** To enable the full Mainline frequency, it is likely further enhancements will be required across wider Sussex such as South Croydon, Stoats Nest and Keymer junctions in the longer term.

*Table 11: Future likely required service changes with the various ITSS and post-COVID recovery scenarios.*

| | | Accumulate services along the row → | | | |
|---|---|---|---|---|---|
| | Growth scenario | 2026 | 2031 | 2041 | 2050 |
| Rows independent of each other | Pre-COVID MAIN-LINE | **+4tph Sussex Mainline—London Bridge (via ECR) (B)** | **+2tph Leatherhead—London Bridge (fast via WCR) (B, F, D)**<br>(+2tph Sussex Mainline—London Victoria) | **+2tph Sussex Mainline—London Bridge (via ECR) (B, F, D)**<br>(+2tph Sussex Mainline—London Victoria) | (+2tph Sussex Mainline—London Victoria) |
| | Medium post-COVID MAINLINE | **+2tph Sussex Mainline—London Bridge (via ECR) (B)** | | **+2tph Sussex Mainline—London Bridge (via ECR) (B)**<br>**+2tph Leatherhead—London Bridge (fast via WCR) (B, F, D)**<br>(+2tph Sussex Mainline—London Victoria) | |
| | Low post-COVID MAINLINE | | | **+2tph Sussex Mainline—London Bridge (via ECR) (B)** | **+2tph Sussex Mainline—London Bridge (via ECR) (B)** |

**Bold**—required for capacity, *Italics*— Connectivity opportunities, ()—knock on / related service changes

# The Strategy: Lines of route & terminals

## London Bridge (Kent) - Metro

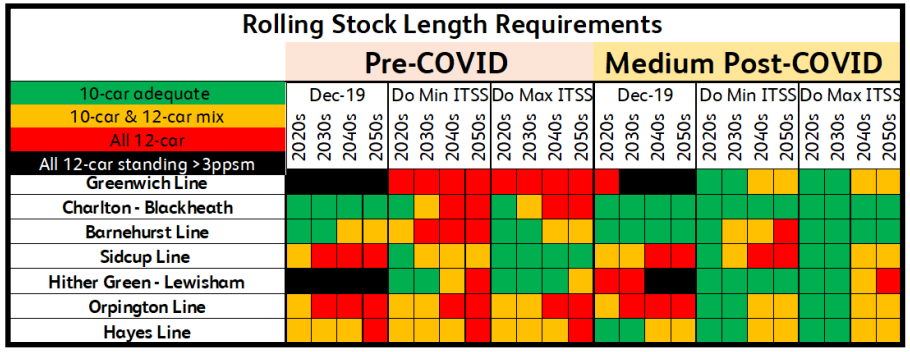
**Lengthening or frequency?** The London Bridge 'Kent Metro' routes are generally 12-car capable, but many Metro services are 10-car. 12-car operation into Charing Cross platforms 4 and above requires selective door opening which Networkers do not have. Rolling stock should be upgraded and run at maximum length (12-car) to increase capacity, along with any necessary complementary signalling and depot enhancements. Services from Blackfriars and Victoria to Lewisham and the Kent Metro area will likely remain 8-car in the medium to long term due to constraints in delivering platform extensions.

*Table 12: Vehicle gap for route*

| Deptford - London Bridge | Pre COVID | | Medium | | Low | |
|---|---|---|---|---|---|---|
| | 2031 | 2050 | 2031 | 2050 | 2031 | 2050 |
| <2 standing passenger per m² | 36 | 45 | 17 | 24 | 2 | 8 |
| <3 standing passenger per m² | 16 | 23 | 1 | 7 | 0 | 0 |
| <4 standing passenger per m² | 2 | 8 | 0 | 0 | 0 | 0 |
| **Hither Green - Lewisham** | **2031** | **2050** | **2031** | **2050** | **2031** | **2050** |
| <2 standing passenger per m² | 29 | 43 | 12 | 23 | 0 | 7 |
| <3 standing passenger per m² | 10 | 22 | 0 | 6 | 0 | 0 |
| <4 standing passenger per m² | 0 | 7 | 0 | 0 | 0 | 0 |
| **New Cross - London Bridge (SE Metro)** | **2031** | **2050** | **2031** | **2050** | **2031** | **2050** |
| <2 standing passenger per m² | 0 | 3 | 0 | 0 | 0 | 0 |
| <3 standing passenger per m² | 0 | 0 | 0 | 0 | 0 | 0 |
| <4 standing passenger per m² | 0 | 0 | 0 | 0 | 0 | 0 |

*Class 700 rolling stock, Dec-19 service

*Table 13: Length of rolling stock required on each route*




### Service Enhancement Options

**Greenwich Line:** Based on pre-COVID forecasts, the Greenwich line required full 12-car operation, and +2tph to Cannon Street, providing 8tph between Abbey Wood, Greenwich, and London Bridge. In a medium post-COVID scenario this is likely pushed back to the 2030s. In a low post-COVID scenario the additional services are not required, but from the 2040s all services need to be 12-car.

**Hither Green—Lewisham:** The Hither Green—Lewisham flow is another crowded route which can be relieved by either +2tph 12-car services via London Bridge or an additional 4 services to Blackfriars (via Denmark Hill) and Victoria (Do Mid & Min). The different uplift amount is due to train lengths.

If an additional 2tph were provided from London Bridge to relieve this flow, this wouldn't remove the need for additional services to relieve the Denmark Hill-Blackfriars flow, or remove the need for 4tph between Lewisham and Victoria to improve orbital connectivity. Therefore, the preferred option is to relieve Lewisham—Hither Green with additional 8-car services from Victoria and/or Blackfriars. The capability constraints at Victoria and Blackfriars Bays are less severe than at Charing Cross and Cannon Street.

In a medium post-COVID scenario, only +2tph 8-car, and not +4tph 8-car, are required between Lewisham and Hither Green. This means, if 4tph are desired between Lewisham and Victoria, the remaining 2tph could be routed to Woolwich/Abbey Wood to improve links with the Elizabeth Line. This would increase frequency between Lewisham and Woolwich to 4tph.

**Lewisham—Woolwich Line:** In most scenarios, frequencies on this link reduce from 3tph to 2tph, in line with TfL Metroisation. This would better allocate peak capacity to where it is required. However, with lower-growth, there is the opportunity to divert more services along this route to enhance connectivity to the Elizabeth Line and to the Bexley Riverside Opportunity Area.

**Barnehurst Line:** In all options, services along the Barnehurst Line reduce from 11tph in Dec-19 to at most 10tph, 12 car operation. This is primarily due to the provision of 4tph between Victoria and Lewisham being split between 2 routes, therefore requiring the peak period 3tph Victoria—Barnehurst Line to reduce to 2tph.

With lengthened rolling stock, some of the Blackheath paths could theoretically be redistributed to more crowded flows in the Kent area, reducing the scale of required capability improvement in the London Bridge area. In this 'Do min' scenario, the Barnehurst Line would still see 8tph. The Bakerloo Line Extension to Hayes would help to offset this by releasing more London Bridge paths for the Kent area.

**Rolling Stock Lengths:** Apart from the Greenwich Line, most lines in a 'Do Max & Mid' scenario should be able to operate with a mixture of 8-car, 10-car, and 12-car services until the 2030s/2040s (pre-COVID). With 'Do Min', full 12-car operation of London Bridge services would be required as the Metro services would be rationalised.

Because of platform lengths at Charing Cross, Networker operated Metro services are limited to 10-car in length into platforms 4 and above. New rolling stock with selective door opening would allow more Charing Cross Metro services to extend to 12-car. Some signalling enhancements would also be necessary across the route.

Southeastern depots are already significantly constrained, so any rolling stock uplift would need to be supported by increased depot provision. One potential location for a new depot is at Hoo Junction between Gravesend and Strood.

# The Strategy: Lines of route & terminals

## London Bridge (Kent) - Metro

**Timetabling Impacts:**

**Lewisham Structure:** To increase frequencies at Lewisham, over time it will become necessary to gradually simplify the routing of services, so that platforms 1&2 predominantly serve Charing Cross, Victoria and Blackfriars (via Denmark Hill), and platforms 3&4 serve Cannon Street. It is not envisaged that full segregation will be required, but gradually the balance of routing through Lewisham is likely needed to allow greater throughput.

**Hither Green—Lewisham:** An increase of +2tph or +4tph between Hither Green and Lewisham is not compatible with the Dec-19 timetable. A wider timetable rewrite would be necessary to allow frequencies to increase. At this stage, it is not certain to what extent a new Hither Green—Lewisham service pattern integrates with the wider network and would need to be subject of a network wide detailed timetable study. Capacity analysis suggests it may be necessary that Grove Park services have reduced calls at Hither Green and/or Lewisham to allow reliable frequency uplifts from both the Grove Park and Sidcup Lines, unless a constraints can be reduced (such as a new timetable structure or grade separation at current flat junctions).

**Sidcup Line:** In a 'Do Max' ITSS scenario, 12tph are provided along the Sidcup Line, with 2 of these ideally minimising journey times to Dartford. Journey times could be under 30 minutes but this would affect the pattern of stopping services, resulting in uneven intervals, and would require additional capability at London Bridge.

**Connectivity:**

Choices exist between providing faster services to London Bridge or greater connectivity to Lewisham from the Metro routes. Services from Hayes, Orpington and Sidcup try to balance both of these opportunities, but as the network becomes more congested, certain connectivity links may need to be prioritised. Additionally, in the off-peak, increased frequencies via Lewisham could be considered, in place of some fast journeys to London Bridge, improving connectivity to the DLR and Victoria services.

With lower post-COVID recovery, allocation of track capacity would likely be more flexible, therefore increased frequencies between Lewisham and Abbey Wood could be considered, enhancing connectivity to the Elizabeth Line.

**Potential Infrastructure & Rolling Stock Enhancements**

*(Letters allow cross-referencing with other ITSS pages & table on page 59)*

- **A: Lengthened & new rolling stock:** Lengthening of rolling stock to 12-car and Class 700 style rolling stock on Metro routes remain essential to maximise crowding reduction with the current infrastructure. Selective door opening would allow 12-car operation into more Charing Cross platforms.
- **F: London Bridge Area capability improvement:** After +4tph into the Sussex side, no spare capability remains at London Bridge without enhancement.
- **H: London Victoria capability improvement**: Limited capability remains, requiring enhancement.
- **Ai: Kent Metro 12-car signalling enhancement:** To allow for more 12-car operation on the Kent Metro.
- **I: South London Line flexibility** options to maximise route capability.
- **U: Hither Green Area Capacity Options** to deconflict higher frequency services.

*Table 14: Future likely required service changes with the various ITSS and post-COVID recovery scenarios.*

| | Accumulate services along the row → | | | |
|---|---|---|---|---|
| | **Growth scenario** | **2026** | **2031** | **2041** | **2050** |
| Rows independent of each other | **Pre-COVID METRO** | **+2tph Greenwich Line—Cannon Street** **(F)**<br>**+2tph Sidcup Line—*Victoria*** **(H, I)**<br>**+2tph Sidcup Line—Blackfriars** (Do Mid & Min only) **(I, U Mid)**<br>(Balancing of Kent Metro services including –1tph Blackheath Line—Victoria)<br>(–2tph Blackheath Line—CHX, -2tph Sidcup Line—CST (Do Min only)) | | **+2tph Sidcup Line—Charing Cross *(fast)*** (Do Max only) **(F, U)** | |
| | **Medium post-COVID METRO** | **+2tph Sidcup Line (Do Max & Min) / *Abbey Wood (Do Mid)—Victoria*** **(H, I)**<br>**+2tph Sidcup Line—Blackfriars** (Do Mid & Min only) **(I)**<br>(Balancing of Kent Metro services including –1tph Blackheath Line—Victoria)<br>(–2tph Blackheath Line—CHX, -2tph Sidcup Line—CHX (Do Min only)) | **+2tph Greenwich Line—Cannon Street** **(F)** | | |
| | **Low post-COVID METRO** | ***+2tph Sidcup Line—Victoria*** **(H, I)**<br>(Balancing of Kent Metro services including –1tph Blackheath Line—Victoria)<br>(Reduction of –2tph Blackheath Line—CHX, (Do Min only)) | | | |

**Bold**—required for capacity, ***Italics***— Connectivity opportunities, ()—knock on / related service changes

# The Strategy: Lines of route & terminals

## London Bridge (Kent) - Mainline

**Lengthening or frequency?**

Generally all Mainline services to London Bridge are 12-car capable, and all future services should be 12-car to minimise the number of additional services required. Therefore, the priority is to enhance frequencies. In theory 3+2 seating would help to increase the seating capacity without lengthening rolling stock, but this would have to be viewed against passenger satisfaction and the 'real' seated capacity, taking into account how passengers use 3+2 seating rolling stock in practice.

*Table 15: Vehicle gap for route*

| Kent to London Bridge | Pre COVID 2031 | Pre COVID 2050 | Medium 2031 | Medium 2050 | Low 2031 | Low 2050 |
|---|---|---|---|---|---|---|
| < 85% of seats occupied | 101 | 156 | 53 | 98 | 13 | 51 |
| < 100% of seats occupied | 59 | 106 | 18 | 57 | 0 | 16 |
| < 1 standing passenger per m² | 8 | 45 | 0 | 6 | 0 | 0 |
| < 2 standing passenger per m² | 0 | 5 | 0 | 0 | 0 | 0 |

*12-car Class 377 rolling stock, Dec-19 service

### Service Enhancement Options

**Definition**: In this study, Kent Mainline refers to fast services between Swanley/Sevenoaks and London. It identifies the likely required services to reduce crowding. **This does not represent the strategy for all Kent Mainline services across Kent.**

**South East Mainline:** An additional 8tph 12-car services could be required by 2050 to eliminate standing. In the Do Min & Mid TSSs, an additional 7tph are added but in the Do Max, an additional 9tph are added to London Bridge. This results in an even service pattern (22tph-24tph) optimised for 2 minute headways.

**Medway & Maidstone:** Of the additional 7-9tph Mainline services created, 3tph would be routed via Swanley to Medway/ Maidstone totalling 6tph between London Bridge and the Chatham Mainline.

**Sevenoaks & Tonbridge:** The remaining 4/6tph would likely be routed via Orpington to Sevenoaks and Tonbridge. This would result in 16-18 fast services per hour, plus any slow or possible new Victoria services on the 2-track Orpington-Tonbridge section. This could require wider route capability interventions, and could likely impact the pattern of stopping services between Orpington and Sevenoaks/Tonbridge.

**Post-COVID:** Post-COVID the requirement for additional services by 2050 remains, with likely +5tph required for the medium scenario (+3tph via ORP), and +2tph required for the low post-COVID scenario (+1tph via ORP). Solutions will need to be found for London Bridge expansion for all post-COVID scenarios, otherwise services may have to be rationalised, with crowding higher than permitted.

**Infrastructure & Rolling Stock Enhancements**

*(Letters allow cross-referencing with other ITSS pages & table on page 59)*

- **F: London Bridge Area capability improvement:** After +4tph into the Sussex side, no spare capability remains at London Bridge without enhancement.
- **J: St Mary Cray Junction enhancement:** The current junction is not optimised for London Bridge—Swanley services.
- **K: Wider route interventions:** To enable the full Mainline frequency, it is likely further enhancements will be required across wider Kent. (Not in study scope)
- **U: Hither Green Area Capacity Options** to deconflict higher frequency services.

*Table 16: Future likely required service changes with the various ITSS and post-COVID recovery scenarios.*

| | | Accumulate services along the row → | | | |
|---|---|---|---|---|---|
| | Growth scenario | 2026 | 2031 | 2041 | 2050 |
| Rows independent of each other | Pre-COVID MAINLINE | +3tph Mainline—London Bridge (F, J, K, U) | +2tph Mainline—London Bridge (F, J, K, U) (+1tph Mainline—Victoria (Do Mid & Min)) (H) | +2tph Mainline—London Bridge (Do Max) (F, J, K, U) | +2tph Mainline—London Bridge (F, J, K, U) |
| | Medium post-COVID MAINLINE | +3tph Mainline—London Bridge (F, J, K, U) | | | +2tph Mainline—London Bridge (F, J, K, U) |
| | Low post-COVID MAINLINE | | | +1tph Mainline—London Bridge (F, J, K) | +1tph Mainline—London Bridge (F, J, K, U) |

**Bold**—required for capacity, *Italics*— Connectivity opportunities, ()—knock on / related service changes

# The Strategy: Lines of route & terminals

## London Victoria (Sussex) - Metro

**Lengthening or frequency?**

Generally, the Victoria Sussex Metro routes are 10-car capable, but stations such as Balham present expensive hurdles for platform extensions up to 12-car. New Metro-style rolling stock, full 10-car operation and limited frequency uplift on Victoria services should be sufficient to meet all reasonable forecasts.

*Table 17: Vehicle gap for route*

| | Pre COVID | | Medium | | Low | |
|---|---|---|---|---|---|---|
| Wandsworth Common - Clapham Jn | 2031 | 2050 | 2031 | 2050 | 2031 | 2050 |
| <2 standing passenger per m² | 0 | 17 | 0 | 0 | 0 | 0 |
| <3 standing passenger per m² | 0 | 0 | 0 | 0 | 0 | 0 |
| <4 standing passenger per m² | 0 | 0 | 0 | 0 | 0 | 0 |
| Mitcham Eastfields - Balham | 2031 | 2050 | 2031 | 2050 | 2031 | 2050 |
| <2 standing passenger per m² | 9 | 15 | 1 | 6 | 0 | 0 |
| <3 standing passenger per m² | 0 | 5 | 0 | 0 | 0 | 0 |
| <4 standing passenger per m² | 0 | 0 | 0 | 0 | 0 | 0 |

*Class 700 rolling stock, 10-car, Dec-19 service

### Service Enhancement Options

**Hackbridge Line:** Up to an additional 2 peak-hour services could be required between Sutton and Victoria via Hackbridge to reduce standing duration in the peak hour, even under a medium post-COVID scenario. This would result in 6tph via Hackbridge to Victoria, providing the option for 2 of these to operate limited stop during the peak. It is possible that of these, 4tph will be required to operate via the Slow Lines from Balham to Victoria following any early Mainline frequency increase (i.e +2tph), although 2tph could potentially continue to operate via the Fast Lines through Clapham Junction and into Victoria would need to be explored with timetable analysis and potential infrastructure interventions (for example new crossovers & signalling). This could result in peak journey times between Sutton and Victoria of under 30 minutes.

**Sussex Metro via Herne Hill:** In the 'Do Min' ITSS, it could be possible to route the additional 2 Hackbridge Line services via Herne Hill to Victoria. This route would be slower but improve connectivity, and not increase timetable pressure around Clapham Junction.

**Norbury / Streatham Hill:** From a capacity perspective, additional services are not necessarily required from Victoria to these routes, assuming Victoria Metro services operate Class 700 10-car rolling stock. However, when considering the knock-on changes for planning all Wimbledon Loop services to Blackfriars, stations like West Norwood, Gipsy Hill or Norbury could see an increase of +2tph, benefiting from redistributed London Bridge paths. Proposed West London Line frequency enhancements could see a further +2tph on the Norbury or Streatham Hill route, but this would be dependent on infrastructure enhancements and wider timetable changes.

**Post-COVID:** in a medium scenario, the requirement for the additional Hackbridge Line services is likely pushed back to the 2030s, and is not necessary at all in a low post-COVID scenario.

**Clapham Junction—Balham Junction Corridor:** Any more than +4/6tph via Clapham Junction and Balham Junction on the Slow Lines (above 14tph) would result in capability improvements being required, such as shortened headways akin to Thameslink Core operation to allow long enough station dwell times and increased frequencies. More than +6tph on the Slow Lines could also require grade separation of Balham Junction or Falcon Road Junction (near Clapham Junction) depending on the timetable structure and performance.

**Victoria:** Increased Metro frequencies will also add pressure to the Victoria approach and platforming. Opportunities to improve performance and increase infrastructure capability will help to make sure increased frequencies can be introduced reliably.

**Connectivity Opportunities:** There are also opportunities beyond capacity relief. Providing at least 2tph on the West London Line to the Sussex Metro area all day, and potentially up to 4tph, would improve orbital connectivity and reduce interchange pressure on Clapham Junction. Of 4tph, 2tph could be routed to Beckenham Junction to connect with the Kent network if sufficient all day paths were identified. This West London Line link could be particularly beneficial with a potential interchange with HS2. It would require an additional 2 paths to be identified in each peak and off-peak hour, which will conflict with increased freight in the off-peak.

**Later Services:** Compared to the 'Kent Metro', the Sussex Metro services finish around 30 minutes-1hr earlier at night, with last services departing between 23:15 and 00:15. Operating later services could bring wider socio-economic benefits and thus should be explored when the franchise / concession is re-let.

**Potential Infrastructure & Rolling Stock Enhancements**

*(Letters allow cross-referencing with other ITSS pages & table on page 59)*

- **A: Lengthened & new rolling stock:** Lengthening of rolling stock to 10-car and Class 700 style rolling stock on Sussex Metro routes would be essential in maximising crowding reduction within the current infrastructure constraints.
- **H: London Victoria capability improvement**: Opportunities exist to increase capacity here.
- **L: Clapham Junction—Balham Junction headway and capability improvement:** Improved signalling and potential infrastructure changes will be needed to reliably operate higher frequencies.
- **M: Hackbridge Line headway reduction:** To allow new services to be added reliably and to operate as fast as possible.
- **E: Wider Sussex Metro route enhancements including West London Line:** Combination of interventions L, R, S, and B depending on service phasing and routing.
- **N: Herne Hill Small Layout Enhancement:** To facilitate parallel country-bound departures from both platforms 3 and 4.

# The Strategy: Lines of route & terminals

## London Victoria (Sussex) - Mainline

**Lengthening or frequency?**

Services are generally already 12-car apart from the Tattenham Corner and Caterham services which are 10 -car. The priority therefore is to increase frequencies in order to reduce crowding.

*Table 18: Vehicle gap for route*

| Sussex to Victoria (into Clapham Jn) | Pre COVID | | Medium | | Low | |
|---|---|---|---|---|---|---|
| | 2031 | 2050 | 2031 | 2050 | 2031 | 2050 |
| < 85% of seats occupied | 96 | 146 | 47 | 88 | 7 | 41 |
| < 100% of seats occupied | 54 | 96 | 12 | 47 | 0 | 7 |
| < 1 standing passenger per m² | 2 | 35 | 0 | 0 | 0 | 0 |
| < 2 standing passenger per m² | 0 | 0 | 0 | 0 | 0 | 0 |

*Class 377 rolling stock, 10-car and 12-car,Dec-19 service

### Service Enhancement Options

**East Croydon—Victoria:** Pre-COVID growth, forecasts +4 services would be required in the peak hour by 2050 to reduce crowding to below 1ppsm, with standing occurring from East Croydon. Providing +6tph to Victoria may help to significantly improve connectivity and the attractiveness of services to Victoria, and help to reduce pressure to London Bridge on selected flows, which is beneficial as the London Bridge area is expected to be significantly challenging to expand. Additionally, this could also support improved connectivity to Crossrail 2, for interchange at either Clapham Junction or Victoria.

**The Croydon bottleneck:** To achieve any Mainline frequency increase to Victoria, it is likely the Croydon bottleneck will need to be relieved—e.g. potentially through grade separation. Additionally, Clapham Junction fast line capacity will quickly become constrained (above +2tph Mainline), benefiting from enhancement.

**Post-COVID:** With the medium scenario, it is likely that, above Dec-19 specification, an additional 2 services will be required in the peak hour by the 2040s.

**Service Routing:** The country-end destinations of these services are not in the scope of this study but are being explored through long term Brighton Mainline Upgrade plans and the Victoria capability improvement project. Improved connectivity between Clapham Junction and Brighton, Victoria to Redhill, fast services to Sutton, and additional services to Caterham/Tattenham Corner (potentially removing the splitting and joining) are all options for consideration.

**Potential Infrastructure & Rolling Stock Enhancements**

*(Letters allow cross-referencing with other ITSS pages & table on page 59)*

- **B: Croydon Area Bottleneck Relief:** Recommended to allow any increase in frequency to West or East Croydon.
- **H: London Victoria capability improvement**: Limited flexible capability remains, requiring enhancement.
- **M: Hackbridge Line headway reduction:** To allow new services to be added reliably and to operate as fast as possible.
- **O: Clapham Junction Fast Line capability improvement:** Capability improvement to permit higher Mainline frequencies through Clapham Junction
- **G: Wider route interventions:** To enable the full Mainline frequency, it is likely further enhancements will be required across wider Sussex such as South Croydon, Stoats Nest and Keymer junctions.

*Table 19: Future likely required service changes with the various ITSS and post-COVID recovery scenari-*

| | | Accumulate services along the row → | | | |
|---|---|---|---|---|---|
| | Growth scenario | 2026 | 2031 | 2041 | 2050 |
| Rows independent of each other | Pre-COVID METRO | **+2tph Sutton—Victoria (via Hackbridge & Balham)** (Do Max & Mid) **(H, M, L)** **+2tph Sutton—Victoria (via Hackbridge & Herne Hill)** (Do Min) **(H, M, N)** | *2tph Watford Jn—West London Line—Clapham Jn—East Croydon/Beckenham Jn* ***(Do Mid & Max) (E)*** *(refer to page 58 for more detail on requirements)* | | *2tph Watford Jn—West London Line—Clapham Jn—East Croydon/Beckenham Jn* ***(Do Min) (E)*** *(refer to page 58 for more detail on requirements)* |
| | Medium post-COVID METRO | | **+2tph Sutton—Victoria (via Hackbridge)** (Routing via Clapham Jn, or via Herne Hill in Do Min) **(H, M, L, (N))** *+2tph Watford Jn—East Croydon/ Beckenham Jn* **(L, E)** *(refer to page 58 for more detail on requirements)* | | |
| | Low post-COVID METRO | | | | *+2tph Watford Jn—East Croydon/ Beckenham Jn* **(L, E)** *(refer to page 58 for more detail on requirements)* |
| | Pre-COVID MAINLINE | | **+2tph Sussex Mainline—London Victoria** (B) | **+2tph Sussex Mainline—London Victoria** (B, H, G, O) | +2tph Sussex Mainline—London Victoria (B, H, G, O) |
| | Medium post-COVID MAINLINE | | | **+2tph Sussex Mainline—London Victoria** (B, H, G) | |

**Bold**—required for capacity, *Italics*— Connectivity opportunities, ()—knock on / related service changes

# The Strategy: Lines of route & terminals

## London Victoria (Kent) - Chatham Mainline

**Lengthening or frequency?**

Herne Hill presents a significant challenge to platform lengthening beyond 8-car, so increasing the frequency of the 8-car Metro services, and new Metro-style rolling stock should be the first priority, with platform lengthening reserved as an option for the future. Mainline services should operate at maximum length, which is 12-car from Medway and 8-car from Maidstone.

*Table 20: Vehicle gap for route*

| | Pre COVID | | Medium | | Low | |
|---|---|---|---|---|---|---|
| Herne Hill - Brixton (Metro) | 2031 | 2050 | 2031 | 2050 | 2031 | 2050 |
| <2 standing passenger per m² | 19 | 25 | 10 | 16 | 3 | 8 |
| <3 standing passenger per m² | 10 | 15 | 3 | 7 | 0 | 1 |
| <4 standing passenger per m² | 3 | 8 | 0 | 0 | 0 | 0 |
| Kent to Victoria via Herne Hill (Mainline) | 2031 | 2050 | 2031 | 2050 | 2031 | 2050 |
| < 85% of seats occupied | 6 | 12 | 0 | 0 | 0 | 0 |
| < 100% of seats occupied | 0 | 4 | 0 | 0 | 0 | 0 |
| < 1 standing passenger per m² | 0 | 0 | 0 | 0 | 0 | 0 |
| < 2 standing passenger per m² | 0 | 0 | 0 | 0 | 0 | 0 |

*Mainline Class 377 rolling stock, 2x8-car and 2x12-car, Dec-19 service

### Service Enhancement Options

**A Challenging Route:** The Chatham Mainline is a challenging line of route as both 'Mainline' and 'Metro' services share the same track. This makes timetabling constrained and therefore has knock on impacts to performance. Any increase of Metro frequency or Metro journey time will result in longer Mainline journey times, unless 'overtaking loops' are extended between Kent House and Penge East.

**Bromley South—Victoria Metro:** An additional 2 Metro services are likely required to meet demand between Herne Hill and Victoria, totalling 6tph (including medium post-COVID), and there are various options for implementing this service. The service options are explored on page 52.

**Mainline Crowding:** Kent Mainline services to Victoria are not forecast to suffer from crowding issues, should all services operate at their maximum length.

**London Bridge Interface:** Should it be possible to enhance connectivity between Maidstone/Medway and London Bridge/Blackfriars, then the strategic importance of the Victoria Mainline services may reduce as passengers are offered a more attractive alternative. Should London Bridge not offer a credible alternative, the priority of developing Kent House—Penge East loops to allow Mainline services to overtake Metro services will increase.

**Potential Infrastructure & Rolling Stock Enhancements**

*(Letters allow cross-referencing with other ITSS pages & table on page 59)*

- **A: New rolling stock:** Standard Class 700 style rolling stock on Metro routes would be essential in maximising crowding reduction with the current infrastructure.
- **H: London Victoria capability improvement**: Limited flexible capability remains, requiring enhancement.
- **K: Wider route interventions:** To enable the full Mainline frequency, it is likely further enhancements will be required across wider Kent, including turnback provision and platform lengthening on the Maidstone East line. (Not in study scope)
- **N: Herne Hill Small Layout Enhancement:** To facilitate parallel country-bound departures from platform 3 and 4.
- **P: Kent House—Penge East Loops:** To permit Mainline services to overtake Metro services
- **Q: Herne Hill performance improvement:** To allow reliable increase in frequencies.

*Table 21: Future likely required service changes with the various ITSS and post-COVID recovery scenari-*

| | | Accumulate services along the row → | | | |
|---|---|---|---|---|---|
| | Growth scenario | 2026 | 2031 | 2041 | 2050 |
| Rows independent of each other | Pre-COVID | **+2tph (Bromley South)—Victoria (Metro)** (Do Max & Mid) **(Q, K)**<br>**+2tph (Sutton)—Victoria (Metro)** (Do Min) **(Q, N)**<br>(+2tph Wimbledon Loop—Blackfriars) **(Q)** | **+1/2tph Mainline—*Victoria (via Denmark Hill or Herne Hill)*** (Do Mid & Min) **(H, Q, P, K)** | (+2tph Wimbledon Loop—Blackfriars) **(Q)** | |
| | Medium post-COVID | **+2tph (Bromley South)—Victoria (Metro)** (Do Max) **(Q, K)**<br>**+2tph (Sutton)—Victoria (Metro)** (Do Min only) **(Q, N)**<br>**+2tph Beckenham Junction—Victoria (Metro)** (Do Mid)<br>(-2tph Beckenham Junction—Blackfriars) (Do Mid)<br>(+2tph Wimbledon Loop—Blackfriars) (Do Mid) **(Q)** | (+2tph Wimbledon Loop—Blackfriars) (Do Min & Max) **(Q)** | | |
| | Low post-COVID | | (+2tph Wimbledon Loop—Blackfriars) (Do Min & Max) **(Q)** | | **+2tph (Bromley South)—Victoria (Metro)** (Do Max) **(Q, K)**<br>**+2tph (Sutton)—Victoria (Metro)** (Do Min only) **(Q, N)**<br>**+2tph Beckenham Junction—Victoria (Metro)** (Do Mid)<br>(-2tph Beckenham Junction—Blackfriars) (Do Mid)<br>(+2tph Wimbledon Loop—Blackfriars) (Do Mid) **(Q)** |

**Bold**—required for capacity, ***Italics***— Connectivity opportunities, ()—knock on / related service changes

# The Strategy: Lines of route & terminals

## London Victoria (Kent) - Chatham Mainline

**Timetabling Options:**

There are various ways to accommodate 6 Metro services per hour, but the preference is to have 10 minute intervals between each service. This would provide 6 slots for Mainline services, even if 4 are only required from a demand perspective. 2 options, of 6 Metro and 6 Mainline services, were tested economically to understand the financial impact of slowing fast services, and the potential value of providing extended loops near Kent House.

Table 22 shows that Option 1 (new overtaking loops maintaining journey times) benefits Mainline services most, whereas option 2 (no new infrastructure and slowing Mainline services) primarily benefits Metro services. There may be opportunity to combine options 2 and 3 (greater use of existing loops) to provide a balanced low cost service upgrade to both Metro and Mainline passengers.

Table 22 shows that the difference in Net Present Value between Option 1 and Option 2 is around £100m, and around £65-£90m can be added to Option 1 costs to result in a similar benefit/cost ratio as Option 2.

The low cost option of slowing Mainline services still results in net benefits as long as Mainline frequencies are increased. This may be acceptable if Mainline services to London Bridge are also enhanced.

Should Mainline journey times need to be protected, providing the cost of infrastructure upgrade (i.e Kent House—Penge East Loops) is less than £100m (difference in Net Present Value between Option 1 and 2), then it is likely more benefits can gained from building the overtaking loops, even with the medium post-COVID scenario.

To avoid overloading Herne Hill, these service increments will need to be added slowly, in combination with Wimbledon Loop service upgrades.

Due to the added pressure on Herne Hill, these service enhancements would likely require **lower pressure options, including:**

- Introduction of 2 new semi-fast services instead of 2 additional Metro *and* 2 additional Mainline services, but there would still need to be compromises to some current Mainline journey times.
- In a medium post-COVID scenario, the Beckenham Junction—Blackfriars service could be diverted to Victoria, thereby not increasing utilisation east of Herne Hill and minimising Mainline service impact. Enhanced Wimbledon Loop services would maintain or increase frequency and capacity between Herne Hill and Blackfriars.
- A new 2tph Metro service could be provided between the Sussex Metro via Tulse Hill and Herne Hill to Victoria to relieve Sussex Metro crowding, and relieve the Herne Hill—Victoria flow, but without significantly increasing Chatham Mainline, Herne Hill or Clapham Junction pressure. Option 4 shows that this is likely only financially viable with higher post-COVID recovery, as this service would require infrastructure enhancement at Herne Hill.

The specific service option chosen will depend on where growth materialises, the value of Mainline journey times, the ability to enhance Wimbledon Loop services, and the confidence in increasing frequencies across Herne Hill.

**All Dec-19 service and future ITSS maps shown in the appendix**

**Herne Hill Capability Constraint:**

Herne Hill presents a significant constraint to increasing frequencies, and any growth along the Chatham Mainline has to be viewed together with Wimbledon Loop—Blackfriars growth. 4 services could be added over Herne Hill to match pre-2018 levels which could account for initial service growth, but Wimbledon Loop growth and any increased Mainline frequencies would require Herne Hill capacity to be squeezed further from the 2030s/2040s. The priority for which services are added first will come down to not only crowding relief, but how well the service improves connectivity.

New, standardised rolling stock, digital signalling, and other performance measures may help to allow Herne Hill to accommodate this. Removing the Herne Hill capacity constraint through grade separation has been explored but it extremely costly, likely making that option a non-starter.

| | Description | Bromley South—Victoria Journey Time | | Benefits/ Opex Costs* (£m) High WFH Low WFH | Net Present Value over 60 years* £m) High WFH Low WFH |
|---|---|---|---|---|---|
| | | Metro | Mainline | | |
| **Dec-19** | 4 fast services and 4 Metro services, no overtaking. | 30 | 19-21 | N/A | N/A |
| **Option 1** | 6 fast services overtake 6 Metro services, with new Kent House—Penge East Loops | 32 | 19-22 | £324.2 / £85.84*<br>£450.4 / 66.6* | £238.3*<br>£383.8* |
| **Option 2** | 6 fast services operate between 6 slow services. No additional infrastructure | 31 | 24-26 | £249.9 / £115.1<br>£362.7 / £94.5 | £134.7<br>£268.2 |
| **Option 3** | 6 fast services overtake 6 Metro services with current Kent House loops | 35 | 20-21 | Not tested | Not tested |
| **infrastructure costs of Kent House—Penge East Loops not included* | | | | | |
| | **Description** | | | **Benefits/ Opex Costs** | **Net Present Value** |
| **Option 4** | New Sutton—Victoria service via Herne Hill (2tph peak only). Requires Herne Hill small layout enhancement (see page 70). | | | £42.9 / £24.4<br>£64.3 / 20.6 | £18.6<br>£44.8 |

*Table 22: Summary of economic impacts of providing additional Metro and Mainline services between Victoria and Bromley South. WFH = Work From Home*

# The Strategy: Lines of route & terminals

## London Victoria (Kent) - Chatham Mainline

*Figure 35: Train graph showing the Bromley South to Victoria section of the Chatham Mainline and how Metro ('slow') and Mainline ('fast') services interact. December 2019 timetable.*

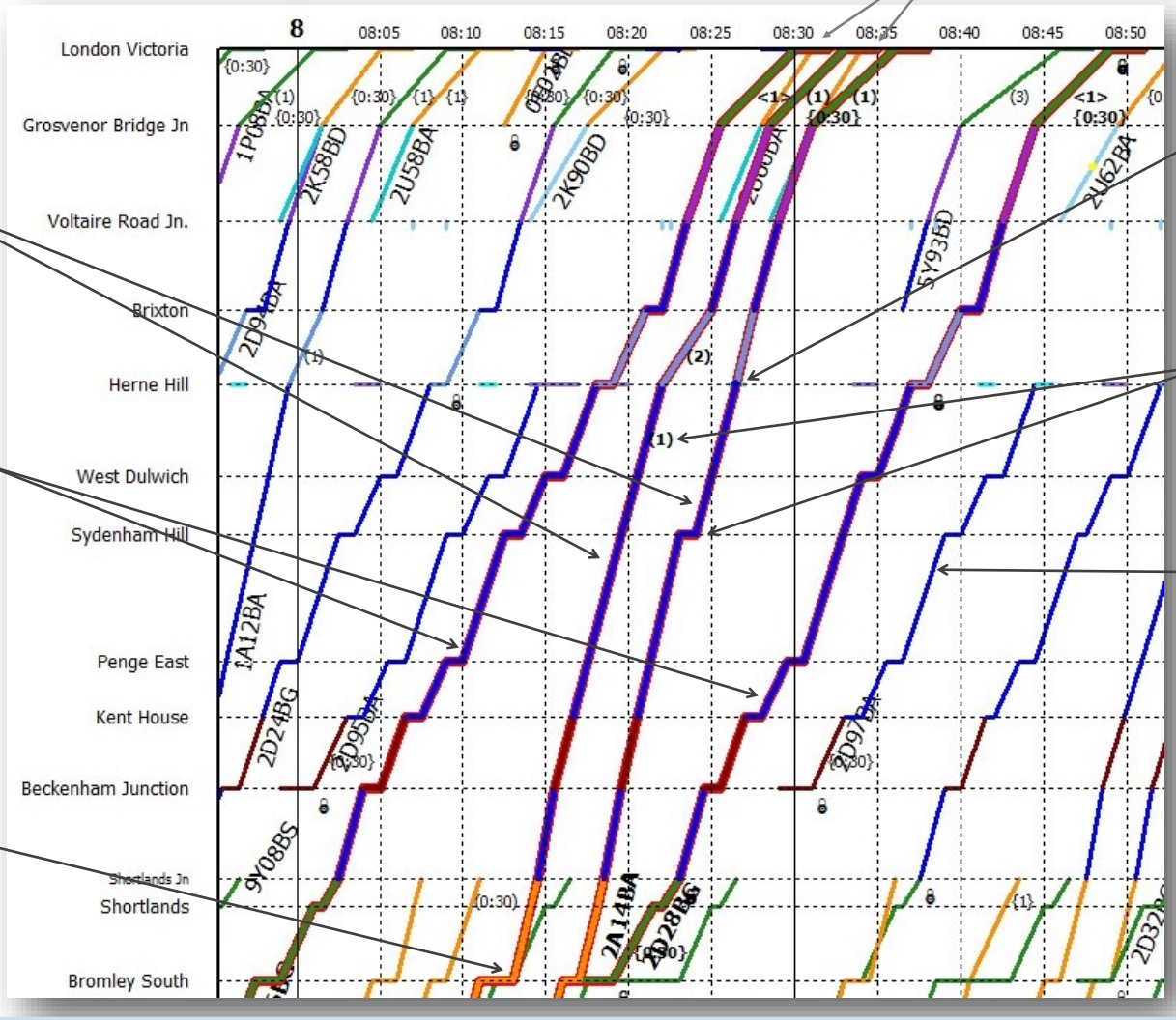
3 services arrive into Victoria with minimum headways between services (3 minutes). Any extension of the first slow service, will knock on to the following two fast services

**Fast services**

(i.e Medway or Maidstone—Victoria)

**Slow services**

(i.e Bromley South or Orpington—Victoria)




3 successive departures from Bromley South to Victoria. The first fast services is unable to depart later due to following services.

The second fast service is unable to depart later as it is fixed at Herne Hill. Any later and it conflicts with Wimbledon Loop services. It would need to depart 3 minutes later, which it can't due to the following slow Victoria service.

'Pathing' time of 3 minutes is already added into the first fast service due to catching up to the preceding slow service. The second fast service has an additional station call instead of pathing time.

Peak only Beckenham Junction—Blackfriars services forces the 2 Mainline services to be grouped together. In the off-peak, the lack of Blackfriars service creates space for fast services to be distributed more evenly.

In the off-peak, the pattern is alternate, with a slow, fast, slow, fast, slow pattern between Bromley South and Victoria. The result is still the same, where fast journey times are maximised by leaving as late as possible from Bromley South, and catching up to the preceding slow service by Victoria. This results in faster journeys than during peak time, aided by lack of Beckenham Junction starters.

**The Chatham Mainline Constraint**

It is evident from the train graph, that if slow services are moved closer together, or slow services become slower, then the fast services would need to be further squeezed and compromised. Service lengthening would usually be an option here, but the costs are prohibitive due to constraints at Herne Hill. As shown on the previous page, net benefits can still be gained if fast journey times are slowed, but higher frequencies would be likely necessary to counter the time disbenefits.

All Dec-19 service and future ITSS maps shown in the appendix

# The Strategy: Lines of route & terminals

## Wimbledon Loop

**Lengthening or frequency?**

Stations on the Wimbledon Loop are generally only 8-car capable with major challenges for lengthening at several locations. As the current frequencies on the Wimbledon Loop are low relative to other locations similar distance from central London, and due to multiple constraints to platform lengthening on the route, increasing frequency should be the first priority.

*Table 23: Vehicle gap for route*

| Wimbledon Chase - Wimbledon | Pre COVID | | Medium | | Low | |
|---|---|---|---|---|---|---|
| | 2031 | 2050 | 2031 | 2050 | 2031 | 2050 |
| <2 standing passenger per m² | 9 | 14 | 5 | 9 | 2 | 5 |
| <3 standing passenger per m² | 5 | 9 | 1 | 5 | 0 | 1 |
| <4 standing passenger per m² | 2 | 5 | 0 | 2 | 0 | 0 |
| **Tooting - Streatham** | 2031 | 2050 | 2031 | 2050 | 2031 | 2050 |
| <2 standing passenger per m² | 6 | 8 | 2 | 4 | 0 | 1 |
| <3 standing passenger per m² | 2 | 4 | 0 | 1 | 0 | 0 |
| <4 standing passenger per m² | 0 | 1 | 0 | 0 | 0 | 0 |
| **Loughborough Jn* – Elephant & Castle** | 2031 | 2050 | 2031 | 2050 | 2031 | 2050 |
| <2 standing passenger per m² | 47 | 66 | 26 | 41 | 8 | 21 |
| <3 standing passenger per m² | 24 | 39 | 7 | 19 | 0 | 3 |
| <4 standing passenger per m² | 8 | 21 | 0 | 4 | 0 | 0 |

*exclusive of Loughborough Jn, so includes flows from Denmark Hill

### Service Enhancement Options

**Dec-19 service:** In the December-2019 timetable there were 2tph in both directions around the Tooting-Wimbledon-Sutton-Hackbridge loop, which resulted in 4tph to Blackfriars via Streatham. This was supplemented by an additional clockwise peak-only 2tph to London Bridge.

**Short Term:** Initially, to relieve crowding on the Wimbledon Loop and the approach into Blackfriars, the current clockwise Wimbledon Loop—London Bridge service should operate anticlockwise as well, and extend into Blackfriars via Herne Hill (LBG-Loop-BFR-Loop-LBG) to provide a further 2tph to Blackfriars and, with Thameslink, provide 4tph in each direction around the Loop. This would result in uneven service intervals, but deliver the required capacity to 2040.

**Medium/Longer Term:** From 2040, there is likely a requirement for 8tph between the Loop and Blackfriars (4tph in each direction). This would require the Loop-London Bridge service to operate instead to Blackfriars via Herne Hill. At this stage, either the uneven interval can continue, or solutions can be found to provide an even interval service, providing greater connectivity benefits. This would require 2 other services to be diverted away from Blackfriars Bay platforms due to platform capacity. The services diverted will depend on passenger growth and the ability to route more Kent Mainline services into London Bridge or Victoria. These longer term proposals could be brought forward to realise the connectivity and economic benefits sooner.

**Economic impact:** A peak frequency of 4tph in both directions around the loop is likely to have net positive benefits (table 26, page 55). If it can operate with even intervals and all 8tph to Blackfriars it is possible the service could be financially positive, bringing money into the industry. As such, this service should be a key priority for enhancement.

**Post-COVID:** In the low post-COVID scenario, only the short term service increment is required (the extended London Bridge service), however should the Beckenham Junction—Blackfriars service be diverted to Victoria to relieve crowding on the Victoria route, then the Wimbledon Loop services may still have to increase to 8tph to Blackfriars to backfill capacity between Herne Hill and Blackfriars.

**Wider Transport Interface:** If transport developments, such as Crossrail 2 and Northern Line enhancements, were to go ahead, then use of the Wimbledon Loop may change. The maximum trains per hour capable on the Loop is 4tph in each direction due to the single Wimbledon platform. Any increase in capacity after the frequency enhancements will have to come from service lengthening or a second platform at Wimbledon.

**Freight:** There is also the potential that freight traffic may increase between Streatham South Junction and

**Potential Infrastructure & Rolling Stock Enhancements**

*(Letters allow cross-referencing with other ITSS pages at table on page 59)*

- **Q: Herne Hill performance improvement:** To allow reliable increase in frequencies.

*Table 24: Future likely required service changes with the various ITSS and post-COVID recovery scenarios.*

| | | Accumulate services along the row → | | | |
|---|---|---|---|---|---|
| | Growth scenario | 2026 | 2031 | 2041 | 2050 |
| Rows independent of each other | Pre-COVID | **+2tph Anticlockwise Wimbledon Loop to Blackfriars** (via extended and anticlockwise LBG—Wimbledon Loop service) **(Q)** | | **+4tph Wimbledon Loop—Blackfriars Bays** **(Q)**<br>(-2tph LBG—Wimbledon Loop—Blackfriars Bays)<br>(2tph Kent Mainline—Blackfriars diverted) | |
| | Medium post-COVID | **+2tph Anticlockwise Wimbledon Loop to Blackfriars** (via extended and anticlockwise LBG—Wimbledon Loop service) (Do Mid) **(Q)**<br>(-2tph Beckenham Junction—Blackfriars Bays) (Do Mid) | **+2tph Anticlockwise Wimbledon Loop to Blackfriars** (via extended and anticlockwise LBG—Wimbledon Loop service) (Do Max & Min) **(Q)**<br>**+4tph Wimbledon Loop—Blackfriars Bays** (Do Mid) **(Q)**<br>(-2tph LBG—Wimbledon Loop—Blackfriars Bays) (Do Mid) | | |
| | Low post-COVID | | **+2tph LBG—Wimbledon Loop—Blackfriars Bays** **(Q)** | | |

**Bold**—required for capacity, *Italics*— Connectivity opportunities, ()—knock on / related service changes

# The Strategy: Lines of route & terminals

## Wimbledon Loop

*Table 25: Summary of key infrastructure constraints for Wimbledon Loop services*

| Constraint | Explanation |
|---|---|
| **Herne Hill**<br>**A** | Herne Hill is a significant flat junction bottleneck where the Wimbledon Loop services cross the Chatham Mainline services. To make the most efficient use of Herne Hill, Wimbledon Loop services must make parallel moves at the junction. In the Dec-19 timetable, this was not the case as the 4tph in each direction, crossed Herne Hill alternately every 7.5 minutes. Increasing to 8tph in both directions would allow parallel moves to be made with each of the Dec-19 services. |
| **Wimbledon Station**<br>**B** | There is only one platform available at Wimbledon for Loop services. Providing an additional platform would rely on the tram being relocated. With a total of 8 services planned through this single platform, the optimum even operation is a service every 7.5 minutes. Wimbledon therefore defines the 8tph service interval of either 7 & 23 minutes or 15 & 15 minutes. A 10 & 20 minute pattern would not allow for 8tph, and would not result in even 8tph interval services to Blackfriars. **A 2nd platform would reduce this rigidity, allowing more timetable options and support reliability.** |
| **Even interval service**<br>**C** | The journey time around the loop to and from Streatham South Junction is 45 minutes, with a service interval of 15 minutes. This results in the northbound and anti-clockwise service conflicting with the 3rd service following behind it. Normally pathing time could be added to rectify this conflict, but this could affect the ability to have the most efficient parallel moves at other locations on the route, such as Herne Hill. With a 7 & 23 minute interval, this conflict does not occur. |

*Table 26: Summary of economic impacts of providing additional Wimbledon Loop services*

| | Description | Benefits/ Costs (£m) High WFH Low WFH | Net Present Value (£m) High WFH Low WFH |
|---|---|---|---|
| **Dec-19** | 2tph anticlockwise, and 4tph clockwise. 4tph to Blackfriars, and 2tph to London Bridge. Anticlockwise service interval 30 minutes, clockwise interval of 10 & 20 minutes. | N/A | N/A |
| **Option 1** | Extension of London Bridge—Loop service to Blackfriars, resulting in 4tph both directions around the Loop. Total Loop service: 6tph to Blackfriars, 2tph to London Bridge. Service interval of 7 & 23 minutes around the Loop. **(peak only)** | 54.3 / 21.1<br>76.7 / 17.3 | 33.3<br>59.4 |
| **Option 2** | 4tph around the Loop, even 15 minute intervals, and all to Blackfriars. London Bridge 2tph paths to Crystal Palace / Norbury route **(peak only)** | 173.3 / **-18.7**<br>227.2 / **-24.3** | 192.1<br>251.4 |

**Wimbledon Loop Even interval 4tph Operation in each direction:**

The Wimbledon Loop paths through the Thameslink Core are every 15 minutes so if a service every 15 minutes was also provided around the Wimbledon Loop, the 'Core' pattern and 'Loop' pattern would have to link. Therefore, without rewriting the whole Thameslink timetable, **only services in one direction around the Wimbledon Loop would be able to have paths through the Thameslink Core** to St Pancras. Services in the opposite direction around the Loop would all start/terminate in the Blackfriars Bay Platforms. There currently is not a preference with which direction (clockwise or anti-clockwise) has 'Core' paths. This operation could help to reduce the performance risk of additional services, as a 2nd turnaround time would be added into at Blackfriars. The service could be St Albans—Thameslink—Wimbledon Loop—Blackfriars Bays.

If the performance risk is still too great, there is the risk that to allow higher frequencies **all 8tph may have to terminate in the Blackfriars Bay platforms (as opposed to just 4tph)**, thereby removing the spread of performance risk into the 'Core'. The much higher frequency would make interchange times at Blackfriars shorter on average. **A second platform at Wimbledon** would introduce more timetable flexibility and likely improve performance and may allow 4tph 'Core' services to continue under higher frequency scenarios. **It is recommended any future Wimbledon station redevelopment considers a 2nd Wimbledon Loop platform.**

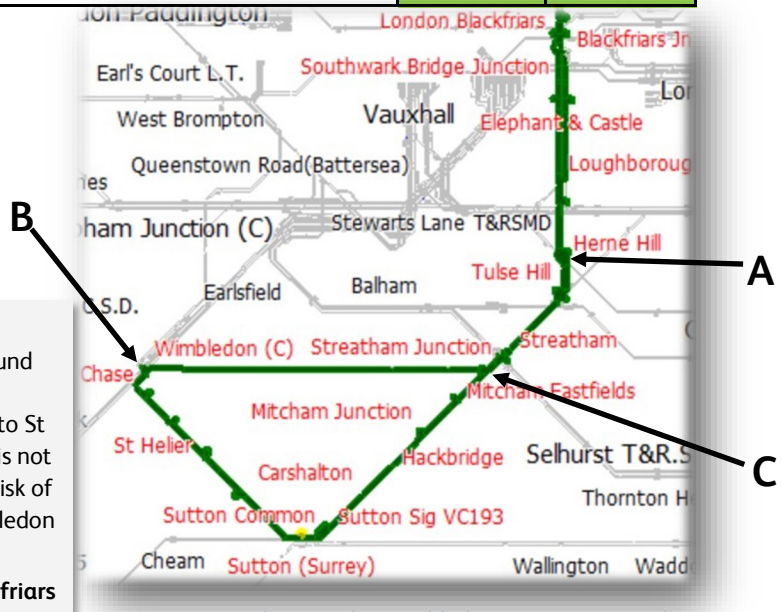



*Figure 36: Map showing the Wimbledon Loop service and the key constraint areas of Herne Hill, Streatham South Junction and Wimbledon. The annotations are explained in table 25.*

All Dec-19 service and future ITSS maps shown in the appendix

# The Strategy: Lines of route & terminals

## South London Line & Catford Loop

**Lengthening or frequency?**

Apart from TfL Overground which is 5-car capable, all other services via Denmark Hill are 8-car due to platform lengths. Due to platform extension constraints at Elephant & Castle, Victoria and Peckham Rye, increasing the length of services is unlikely to present value for money. Increasing the connectivity to Victoria and Blackfriars, as well as on TfL Overground services, would not only increase capacity, but also connectivity, resulting in greater benefits. Increasing the frequency is therefore the first priority.

*Table 27: Vehicle gap for route*

| | Pre COVID | | Medium | | Low | |
|---|---|---|---|---|---|---|
| Denmark Hill – Loughborough Junction | 2031 | 2050 | 2031 | 2050 | 2031 | 2050 |
| <2 standing passenger per m² | 19 | 25 | 10 | 16 | 3 | 8 |
| <3 standing passenger per m² | 10 | 15 | 3 | 7 | 0 | 1 |
| <4 standing passenger per m² | 4 | 8 | 0 | 1 | 0 | 0 |
| Peckham Rye – Denmark Hill | 2031 | 2050 | 2031 | 2050 | 2031 | 2050 |
| <2 standing passenger per m² | 14 | 25 | 0 | 7 | 0 | 0 |
| <3 standing passenger per m² | 0 | 6 | 0 | 0 | 0 | 0 |
| <4 standing passenger per m² | 0 | 0 | 0 | 0 | 0 | 0 |
| Queens Road Peckham - Surrey Quays | 2031 | 2050 | 2031 | 2050 | 2031 | 2050 |
| <2 standing passenger per m² | 12 | 17 | 7 | 11 | 3 | 6 |
| <3 standing passenger per m² | 6 | 10 | 2 | 5 | 0 | 1 |
| <4 standing passenger per m² | 2 | 5 | 0 | 1 | 0 | 0 |
| TfL Overground - Class 378, Dec-19 service<br>Non TfL Overground - Class 700 rolling stock, 8-car, Dec-19 service | | | | | | |
| Kent Mainline to Blackfriars (via Catford Loop) | 2031 | 2050 | 2031 | 2050 | 2031 | 2050 |
| < 85% of seats occupied | 10 | 13 | 6 | 8 | 2 | 4 |
| < 100% of seats occupied | 6 | 9 | 3 | 5 | 0 | 1 |
| < 1 standing passenger per m² | 2 | 4 | 0 | 0 | 0 | 0 |
| < 2 standing passenger per m² | 0 | 0 | 0 | 0 | 0 | 0 |
| Kent Mainline to Victoria (via Catford Loop) | 2031 | 2050 | 2031 | 2050 | 2031 | 2050 |
| < 85% of seats occupied | 8 | 11 | 3 | 5 | 0 | 0 |
| < 100% of seats occupied | 3 | 6 | 0 | 1 | 0 | 0 |
| < 1 standing passenger per m² | 0 | 0 | 0 | 0 | 0 | 0 |
| < 2 standing passenger per m² | 0 | 0 | 0 | 0 | 0 | 0 |
| Class 377 rolling stock, 8-car, Dec-19 service. | | | | | | |

### Service Enhancement Options

**Catford Loop (Metro):** An additional 2 services are likely required between Denmark Hill and Blackfriars to relieve crowding, even in the medium post-COVID scenario. These +2 services can either route from Bellingham or potentially via Lewisham. Following the recent frequency improvement on the Catford Loop, and new rolling stock, the line does not necessarily require additional services. However, from the 2040s it may be necessary to specify additional calls in some Mainline services on the Catford Loop to reduce standing duration. The impact of the potential Bakerloo Line extension to Hayes may change the usage of the Catford Loop. It is therefore preferable that the +2 services to Blackfriars are routed via Lewisham to relieve more crowded routes (page 46). Current 3-2 seating rolling stock would ideally be replaced with Class 700 style Metro rolling stock on Metro routes.

**Catford Loop (Mainline):** Additional Mainline services to Victoria and Blackfriars are likely to have standing from Bromley South. In the 'Do Max' ITSS scenario additional Mainline services are provided to London Bridge helping to boost Kent Mainline flows into London. In 'Do Mid' and 'Do Min' ITSS scenarios, an additional Mainline service would be provided to Victoria to relieve the Catford Loop flow, as the uplift to London Bridge would be lower. In the medium post-COVID scenario this requirement isn't explicitly needed, and in a low post-COVID scenario, the number of Mainline services could potentially reduce by 1 to Victoria, with a reallocation of capacity to other services (i.e increased frequencies to Lewisham).

**Blackfriars Bay Capability:** Kent Mainline or Beckenham Junction Metro services to Blackfriars may have to be reassigned to Victoria if an additional 4tph Wimbledon Loop services operate to Blackfriars. This is because of limited bay platform capacity at Blackfriars permitting a total of 8 services per hour. Full uplift of Wimbledon Loop frequencies is only necessary from a pre-COVID capacity perspective from the 2040s, but could be brought forward to realise to connectivity and economic benefits sooner. Improved connectivity from Kent Mainline routes to London Bridge may help to reduce the impact of this potential change.

Closer to the time of implementation, a choice will need to be made over the priority of capacity utilisation at Blackfriars bay platforms, considering additional Wimbledon Loop frequencies (+4tph), current Beckenham Junction—Blackfriars services (2tph), current Kent Mainline services (2tph) and new Metro services from Lewisham/Catford Loop to Blackfriars (+2tph).

In a 'Do Max' ITSS scenario it is assumed that additional capability can be constructed at Blackfriars, eliminating the need for service diversion to Victoria.

# The Strategy: Lines of route & terminals

## South London Line & Catford Loop

### Service Enhancement Options

**South London Line:** There are connectivity and capacity aspirations to increase Overground services by 2tph to 6tph between the East London Line and Clapham Junction, and to increase Lewisham-Victoria services to 4tph. This would accommodate pre-COVID growth west of Denmark Hill and on Overground services up to 2050.

**Impact to Clapham Junction:** Operating +2tph Overground services to from East London Line to Clapham Junction would ideally operate with enhanced Clapham Junction capacity. In the short term, shorter turnarounds and stepping back of drivers may allow enhanced frequency into the current platforms. Additionally, better use of current platforms, including bi-directional working on platform 16, could create additional capacity and improve Clapham Junction capability. In the longer term, platform 0 reinstatement would likely be beneficial due to longer term growth of other passenger and freight services through Clapham Junction.

**Timetable Impact & Infrastructure:** The service enhancements specified for increased frequencies on the Catford Loop and South London Line would result in a total of +5tph between Peckham Rye and Denmark Hill. Capacity analysis suggests this should be feasible, but may require a wider timetable rewrite and would benefit from greater South London Line flexibility.

It is likely that the +2tph to Blackfriars from Lewisham/Catford Loop will not integrate with freight, and therefore will have to be a peak only service. However, 4tph Lewisham—Victoria and enhanced 6tph TfL Overground should integrate with freight and was specified in the London Rail Freight Strategy. More information about integration with freight can be found on page 65.

Opportunities to improve the performance and flexibility of routing along the South London Line may make introducing these services more achievable, including constructing an additional crossover and providing more turnback opportunities, helping to localise disruption and de-conflict the timetable.

**Potential Infrastructure & Rolling Stock Enhancements**
*(Letters allow cross-referencing with other ITSS pages & table on page 59)*

- **A: New rolling stock:** Standard Class 700 style rolling stock on Metro routes would be essential in maximising crowding reduction with the current infrastructure. Overground could remain with Class 378/710 style stock.
- **H: London Victoria capability improvement**: Limited flexible capability remains, requiring enhancement.
- **K: Wider route interventions:** To enable the full Mainline frequency, it is likely enhancements will be required across wider Kent. (Not in scope)
- **I: South London Line flexibility** options to maximise route capability.
- **R: Clapham Junction Metro & Freight Capability Improvement:** To increase terminating capability for additional West London Line and South London Line services.
- **U: Hither Green Area Capacity Options** to deconflict higher frequency services.

*Table 28: Future likely required service changes with the various ITSS and post-COVID recovery scenari-*

| | | Accumulate services along the row → | | | |
|---|---|---|---|---|---|
| | Growth scenario | 2026 | 2031 | 2041 | 2050 |
| Rows independent of each other | Pre-COVID | **+2tph East London Line—Clapham Junction** **(R)**<br>**+2tph Sidcup Line—*Victoria*** (–1tph Blackheath Line—Victoria) **(I)**<br>**+2tph Sidcup Line—Blackfriars** (Do Mid & Min only) **(U Mid)** | **+1*(-2)*tph Mainline—*Victoria (via Denmark Hill or Herne Hill)***<br>(Do Mid & Min) **(H, K))** | (2tph Kent Mainline—Blackfriars diverted to either VIC or LBG) (Do Mid & Do Min) | |
| | Medium post-COVID | **+2tph East London Line—Clapham Junction** **(R)**<br>**+2tph Sidcup Line (Do Max) / *Abbey Wood (Do Mid & Min)—Victoria*** (–1tph Blackheath Line—Victoria) **(I)**<br>**+2tph Sidcup Line—Blackfriars** (Do Mid & Min only) **(I)** | | | |
| | Low post-COVID | ***+2tph Sidcup Line—Victoria*** (–1tph Blackheath Line—Victoria)<br>-1ph Kent Mainline—Victoria (via Catford) (Do Mid & Min) | | ***+2tph East London Line—Clapham Junction*** **(R)** | - |

**Bold**—required for capacity, *Italics*— Connectivity opportunities, ()—knock on / related service changes

# The Strategy: Lines of route & terminals

## West London Line

**Lengthening or frequency?**

TfL Overground services are 5-cars in length, bound by platforms across the network, including Clapham Junction, Stratford and along the North London Line. The platforms on the West London Line are 8-car, hence there is value in operating more 8-car Sussex Metro services towards the West Coast Mainline. The first priority is to increase frequencies, in line with TfL aspirations. Lengthening of services may be necessary in the longer term subject to orbital growth and platform extensions.

*Table 29: Vehicle gap for route*

| | Pre COVID | | Medium | | Low | |
|---|---|---|---|---|---|---|
| Clapham Jn - Imperial Wharf | 2031 | 2050 | 2031 | 2050 | 2031 | 2050 |
| <2 standing passenger per m² | 13 | 21 | 5 | 11 | 0 | 3 |
| <3 standing passenger per m² | 3 | 9 | 0 | 1 | 0 | 0 |
| <4 standing passenger per m² | 0 | 1 | 0 | 0 | 0 | 0 |
| Willesden Jn - Shepherd's Bush | 2031 | 2050 | 2031 | 2050 | 2031 | 2050 |
| <2 standing passenger per m² | 9 | 16 | 3 | 9 | 0 | 2 |
| <3 standing passenger per m² | 2 | 5 | 0 | 1 | 0 | 0 |
| <4 standing passenger per m² | 0 | 0 | 0 | 0 | 0 | 0 |

*Non TfL Overground - Class 700 rolling stock, 8-car, Dec-19 service. Based on 5tph TfL Overground.

### Service Enhancement Options

**Short Term:** TfL plan to introduce an additional 2 services shuttling between Clapham Junction and Shepherd's Bush. This is a good shorter term capacity relief solution, but the strategy should be to replace these with through services, relieving the West London Line—Willesden Junction crowded section. If both South London Line and West London Line TfL services increase by 2tph, then Clapham Junction will need enhanced capability, including possible line speed enhancements, a potential platform 16 turnback, a new platform 0, or stepping back of drivers.

**Non-TfL Services:** In a Do Mid and Max ITSS scenario, the order of adding additional services is different from Do Min, adding additional Watford Junction-Sussex Metro services earlier. Being 8 -car, they deliver better capacity relief into Clapham Junction, and also improve connectivity. However, they will likely require wider route upgrades due to the quantity of flat junctions and congested sections they route through impacting performance.

Should these enhancements be challenging, an alternative would be to operate 8-car Overground services from Clapham Junction to Shepherd's Bush, or through to Willesden Junction with signalling, platform and turnback enhancements.

**Long Term Uplift:** Nevertheless, by 2050 (pre-COVID growth), there should be a total of +4tph (11tph into Clapham Jn) as this will help significantly with crowding and the high passenger 'churn' along the route. 11tph is 1tph less than TfL's Metroisation proposal.

**Post-COVID:** Even if the frequency was 10tph, sufficient capacity would still be provided for Pre-COVID 2050 forecasts. In post-COVID scenarios capacity relief is still necessary, and the opportunities to improve connectivity still remain, however the frequency uplift is lower compared to pre-COVID forecasts, with Overground needing to increase by just 1tph in the short term (resulting in 6tph Overground).

Connectivity opportunities also remain, so a 2tph off-peak Watford-Sussex Metro service should be considered, and potentially be increased in frequency in the longer term.

**Freight Interface:** When the infrastructure requirements are needed depends heavily on other growth across South London and freight growth. The interaction of freight and passenger services is explored more on page 65.

**Potential Infrastructure & Rolling Stock Enhancements**

*(Letters allow cross-referencing with other ITSS pages & table on page 59)*

- **A: New rolling stock:** Standard 8-car Class 700 style rolling stock on non TfL Metro services would be essential in maximising crowding reduction with the current infrastructure.
- **E: Wider Sussex Metro route enhancements including West London Line and Clapham Junction—Balham Junction capability improvement:** To increase passenger and freight frequencies for orbital connectivity affecting Sussex Metro area.
- **R: Clapham Junction Metro & Freight Capability Improvement:** To increase terminating capability for additional West London Line and South London Line services.
- **S: Improved West London Line headways:** Improve infrastructure capability by introducing 3-minute headways
- **T: Enhanced AC/DC changeover:** Extending the Overhead Line Equipment to Shepherd's Bush to allow traction changeover during the station call. This would improve journey times and therefore increase infrastructure capability.
- **V: West Coast Mainline performance interaction:** Options to reduce performance impact of WCML—West London Line services.
- **W: Willesden Junction signalling enhancement:** To shorten headways and margins and allow increased frequencies.

*Table 30: Future likely required service changes with the various ITSS and post-COVID recovery scenari-*

| | | Accumulate services along the row → | | | |
|---|---|---|---|---|---|
| | Growth scenario | 2026 | 2031 | 2041 | 2050 |
| Rows independent of each other | Pre-COVID | +1tph Clapham Jn—Willesden Junction **(W)**<br>(-1tph Clapham Jn—Shepherd's Bush) | +1tph Clapham Jn—Willesden Junction (Do Min) **(W)**<br>(-1tph Clapham Jn—Shepherd's Bush) (Do Min)<br>*2tph Watford Jn—West London Line—Clapham Jn—East Croydon/Beckenham Jn* (Do Mid & Max) **(R, E, S, T, V)** | | *2tph Watford Jn—West London Line—Clapham Jn—East Croydon/Beckenham Jn* (Do Min) **(R, E, S, T, V)**<br>+1tph Clapham Jn—Willesden Junction (Do Mid & Max) **(W)**<br>(-1tph Clapham Jn—Shepherd's Bush) (Do Mid & Max) |
| | Medium post-COVID | +1tph Clapham Jn—Willesden Junction **(W)**<br>(-1tph Clapham Jn—Shepherd's Bush) | *2tph Watford Jn —East Croydon / Beckenham Jn* (Do Mid & Max) **(R, E, S, T, V)**<br>(-1tph Clapham Jn—Shepherd's Bush) | | *+2tph Watford Jn —East Croydon / Beckenham Jn* (Do Min) **(R, E, S, T, V)** |
| | Low post-COVID | *+1tph Clapham Jn—Willesden Junction* **(W)**<br>(-1tph Clapham Jn—Shepherd's Bush) | | | *+2tph Watford Jn—East Croydon/Beckenham Jn* **(L, E)** |

**Bold**—required for capacity, *Italics*— Connectivity opportunities, ()—knock on / related service changes

# The Strategy: Lines of route & terminals

## Summary of Potential Enhancements

*Table 31: Summary of potential infrastructure requirements to enhance the current network. Further development work may identify further requirements*

| ID | Title | Brief Description |
|---|---|---|
| | **Junction Remodelling / Improved Track Layout** | |
| B | **Croydon Area Bottleneck Relief** | Recommended to allow any increase in frequency to West Croydon or East Croydon. |
| N | **Herne Hill Small Layout Enhancement** | To facilitate parallel country-bound departures from platform 3 and 4. |
| I | **South London Line flexibility** | Options required to maximise route capability—improving timetable and routing flexibility. |
| J | **St Mary Cray Junction enhancement** | The current junction is not optimised for London Bridge—Swanley services. |
| P | **Kent House—Penge East Loops** | To permit Mainline services to overtake Metro services. |
| U | **Hither Green Area Capacity** | To deconflict train movements on the busy section between Hither Green and Lewisham / Tanners Hill Junction to allow increased frequencies and improved performance. |
| | **Terminal Capability** | |
| F | **London Bridge Area Capability Improvement** | After +4tph into the Sussex side, no spare capability remains at London Bridge without enhancement. |
| H | **London Victoria Capability Improvement** | Limited flexible capability remains, requiring improvement. |
| O | **Clapham Junction Fast Line Capability Improvement** | Capability improvement to permit higher Mainline frequencies through Clapham Junction |
| R | **Clapham Junction Metro & Freight Capability Improvement** | To increase terminating capability for additional West London Line and East London Line services. |
| C | **Turnback Opportunities** | Required on Wallington Line for enhanced TfL Overground service. |
| | **Signalling** | |
| D | **Sydenham Corridor & Wallington Line headway reduction** | Pushing services up to 28-30tph on the Sydenham Corridor would require very reliable operation of services and shortest headways possible. Digital signalling, and potentially Automatic Train Operation in the longer term would be required to deliver this. Headways on the West Croydon—Sutton route would also require shortening to accommodate additional fast services better performing higher frequencies. |
| L | **Clapham Junction—Balham Junction headway and capability improvement** | To accommodate higher frequency performance will be pushed requiring improved reliability, such as improved signalling and potential infrastructure changes. |
| M | **Hackbridge Line headway reduction** | To allow new services to be added reliably and to operate as fast as possible. |
| S | **Improved West London Line headways** | Improve infrastructure capability by introducing 3-minute headways |
| W | **Willesden Junction signalling enhancement** | To shorten headways and margins and allow increased frequencies. |
| Ai | **Kent Metro 12-car signalling enhancement** | To allow for more 12-car operation on the Kent Metro. ('Ai' as connected to 'A' - 'Lengthened & new rolling stock') |
| | **Wider Route Interventions** | |
| E | **Wider Sussex Metro route improvements including West London Line and Clapham Junction—Balham Junction capability improvement** | Combination of interventions L, R, S, and B depending on service introduction phasing and routing. |
| G | **Wider Sussex route interventions** | To enable the full Mainline frequency, it is likely further improvements will be required across wider Sussex such as South Croydon, Stoats Nest and Keymer junctions. |
| K | **Wider Kent route interventions** | To enable the full Mainline frequency, it is likely further improvements will be required across wider Kent. (Not in study scope) |
| | **Other** | |
| A | **Lengthened & new rolling stock** | 1) Lengthening of rolling stock where possible. 2) Standard Class 700 style rolling stock on Metro routes would be essential in maximising crowding reduction with the current infrastructure. |
| Q | **Herne Hill performance improvement** | To allow reliable increase in frequencies. |
| T | **Enhanced AC/DC changeover** | Extending the Overhead Line Equipment to Shepherd's Bush to allow traction changeover during the station call. This would improve journey times and therefore increase infrastructure capability. |
| V | **West Coast Mainline performance interaction** | Options to reduce performance impact of WCML—West London Line services. |

# 5

# The Strategy Interfaces & Projects

- Croydon Area Bottleneck Relief
- London Victoria capability improvement (and approach routes)
- Clapham Junction Capability Improvement
- London Bridge Area Capability
- Freight interaction
- Rolling stock requirements
- Platform extensions
- Performance
- Digital Rail & signalling
- South London Line Flexibility
- Kent House—Penge East Loops
- Third rail power enhancement
- Herne Hill small layout enhancement
- Hither Green area capacity options
- Wider route enhancements
- North of the River Thames
- New terminal opportunity
- Orbital connectivity
- Enhanced Sunday frequencies
- Improved journey times to Sutton & Dartford
- Interface with TfL Metroisation
- Stations & Accessibility
- Case Studies: Peckham Rye & Lewisham station upgrade

# The Strategy: Interfaces & Projects

## Croydon Area Bottleneck Relief (B)

### Purpose

Croydon is at the heart of the Brighton Main Line. Services converge from across South East England and then diverge towards a range of London termini (London Victoria, London Bridge and Thameslink). The breadth of locations connected, and the passenger demand necessitates a high-frequency service, which is expected to need to increase to accommodate post-COVID recovery. The range of destinations currently served via Croydon requires a complex operation with multiple at-grade crossing moves between running lines. In addition, the route is also a key freight artery, with aspirations for further growth.

These at-grade crossing moves are a choice made to provide direct services to multiple destinations. Each crossing move also comes at the cost of network capacity, and links the punctuality of services from London with those running to London and beyond on to the West London Line, West Coast Main Line, Midland Main Line, East Coast Main Line, and East London Line.

### Potential Service & Infrastructure Changes

Infrastructure and service changes will depend heavily on post-COVID recovery and available funding. It is possible that additional frequencies could be achieved through service and route simplification—but this introduces connectivity disbenefits. Alternatively, additional infrastructure could be constructed to deconflict services and allow for improved connectivity and frequency. The possible options that require further consideration are summarised below:

**1) Re-timetabling within the existing structure;**

- Simplify the timetable structure and change the ratio of links to London terminals. This could have connectivity and journey time impacts.
- Reduce amount of services terminating at Croydon to increase station throughput.

**2) Infrastructure interventions to enable greater flexibility in timetable solutions;**

- Targeted grade separation including the selected junctions north of Croydon. Also likely to consider other grade separation/enhancements on the Brighton Mainline to support Brighton Mainline performance.
- Enhancing the Slow Lines, with the potential need for additional tracks at East Croydon and consideration of additional platforms to increase track capacity.

**3) A combination of all of the above.**

### Next Steps

Further development work will be necessary to identify short term and longer term solutions suitable for post-COVID recovery, performance and freight growth. The scope will also be influenced by the outputs, outcomes or objectives from other service and infrastructure enhancements.

# The Strategy: Interfaces & Projects

**Status: Strategic Outline Business Case underway (Victoria)**

**Status: Pre-Strategic Outline Business Case (Clapham Jn)**

## London Victoria Capability Improvement (& approach routes) (H)

**Purpose**

Track renewals of the Victoria 'throat' planned for the 2030s present an opportunity to enhance the track layout and improve the capability of the infrastructure. This could lead to improved operational performance and new train paths, accommodating passenger growth and improving connectivity.

A Strategic Outline Business Case is currently underway identifying train service and infrastructure steps between the current layout and service and an end-state, 2050, layout and service. The purpose is to identify a 'sweet spot' which presents value for money, delivers train service benefits, and sets the scene for longer term enhancement.

Victoria is a key alternative terminal to the London Bridge area, and offering a more attractive rail service, above what predicted demand requires, will help to attract some growth away from London Bridge. As explored on page 63 and 64, expanding London Bridge presents significant challenges, therefore seizing efficient opportunities to improve the capability of Victoria will help to reduce the constraints in South London and prepare the network for future growth. Additionally, Crossrail 2 (if progressed) would increase the importance of Victoria.

**Train service outputs**

At this stage of development final train service outputs are not defined. It would be expected that reliability of services would improve, and depending on the level of infrastructure requirements, increased frequencies on routes aligned to the wider South London & Thameslink Service Improvement Study. This could potential include 4tph Victoria to Lewisham, increased Chatham Mainline frequencies, and increased Sussex Metro services to the Hackbridge Line.

**Infrastructure Changes**

Infrastructure changes are yet to be defined depending on the outputs of timetable analysis, economic analysis and infrastructure feasibility.

It would be expected that the layout will be streamlined to better suit the future train service. This could include new crossovers, enhanced linespeeds, enhanced signalling, and consideration of platform extensions.

It would be expected that any upgrades would make the layout fit for purpose for the lifetime of the renewed asset (typically 30-40 years), therefore needs to be shaped by long-term requirements.

Smaller scale enhancement opportunities will also be identified which could be progressed independently of the overarching Victoria capability improvement scheme.

## Clapham Junction Capability Improvement (O & R)

**Fast Lines:** The Sussex Route Study (2015, p.163) identified an opportunity to enhance Clapham Junction to allow greater flexible use of platforms and allow a 'tidal' flow to operate. This would allow for higher frequency Fast Line services, by connecting the Slows Lines to/from Victoria to Platforms 16 and 17 (currently only used by West London Line services).

This would mean there would be less capability to terminate services at platform 16, driving a dependency on providing an alternative for any Metro services terminating in those platforms. It is expected that Digital Signalling will also provide an opportunity to allow increased frequencies through Clapham Junction.

**West London Line & South London Line:** TfL have aspirations to increase both West London Line and South London Line services up to 7tph and 6tph, up from 5tph and 4tph respectively. This will require either changes to operational methods or infrastructure to accommodate and is the subject of detailed work. Possible shorter term solutions to improve the capability of Clapham Junction for West London Line, South London Line services include allowing stepping back of drivers, enhancing the line speed on the station approach, and enhancing the signalling to terminate services in platform 16.

In the longer term, additional Sussex Metro and freight services may require more capacity through platform 16 and 17. Platform 0 could assist with this, providing an alternative turnback platform and increasing Clapham Junction capability.

# The Strategy: Interfaces & Projects

## London Bridge Area Capability (F)

London Bridge caters for terminating services, as well as through services to Charing Cross, the Thameslink Core, and Cannon Street. As such, it is a limiting factor for Sussex and Kent Mainline and Metro growth. The table below outlines possible future peak hour additional capacity requirements, taking into account that capacity remains for 4 services (above Dec-19 level).

*Table 32: Additional London Bridge area capability requirements*

| Additional LBG capability TARGET 2050 | Do Max | Do Mid | Do Min |
|---|---|---|---|
| Pre-COVID | +17tph | +13tph | +9tph |
| Medium post-COVID | +9tph | +9tph | +5tph |
| Low post-COVID | +2tph | +0tph | +0tph |

**Bakerloo Line Extension to Hayes** | **LBG Capability: +6tph**

Should the Bakerloo Line be extended to Lewisham, and then beyond to Hayes, this would allow the 6 services between Cannon Street/Charing Cross and Hayes in the peak hour to be reassigned. If all assigned to Kent Mainline services, it would fully cover the low and medium post-COVID scenarios to 2050.

Unlike other capability improvement schemes, not only is pure rail capacity delivered, but also all the associated benefits of extending the London Underground into South East London. More information is available on page 85.

**New Terminal / 'Crossrail3'** | **LBG Capability: up to +24tph**

A large scale solution would be to construct a new terminal, e.g. at Canary Wharf, or to construct a new cross-London railway which could significantly relieve London Bridge area capability constraints, but at significant cost. However, there is the possibility it may present better value for money than expanding existing constrained terminals and associated approach upgrades.

**Kent Metro Service Rationalising** | **LBG Capability: +4tph**

As already included in the 'Do Min' ITSS scenario, should all Kent Metro services to London Bridge be extended to 12-car and utilise Class 700 rolling stock, there could be opportunity to reduce some frequencies whilst protecting crowding densities, and maintaining a turn-up-and-go service. For example, the data suggests that reducing services via Barnehurst to London Bridge from 11tph to 8tph, and diverting 2tph on the Sidcup Line to Blackfriars would meet the most ambitious targets. This is not the preferred solution for London Bridge area capability, but may be necessary if other solutions are not feasible, or if growth rises quicker on Mainline rather than Metro services.

**Shorter Turnaround**

A key part of TfL's Metroisation proposal is for turnaround times at stations to be shorter. Currently these are between 7-10 minutes for 8 -12 car length units. TfL propose 'stepping-back' drivers, so drivers are not linked to the same train, therefore allowing shorter turnaround times. Enough turnaround time would still need to be provided to clear the train and platform at terminal stations, and to protect performance. The exact capability this could provide depends on which, and how many, services this could be used for (primarily Metro services), and how it fits with the surrounding timetable constraints. This would require additional train crew and increase performance risk.

**Status: Pre– Strategic Outline Business Case**

| Consider for development | Challenging | Very challenging |
|---|---|---|

**Cannon Street Metropolitan Reversible** | **LBG Capability: +1tph**

This chord could be utilised to stable 1tph (12-car) in the peak period. There are options to turn into a siding, with access only from platforms 4-7 or to maintain the Thameslink connection but stabling only available from platforms 5-7. During the shoulder-peak the unit would return to Cannon Street and depart through London Bridge. It is likely that enhancement would be necessary to deliver the optimal output. Severing the link to Thameslink would reduce operational flexibility.

**London Bridge Bays Remodelling** | **LBG Capability: +2tph**

20tph operated into the 6 bay platforms at London Bridge in the Dec-19 timetable. Capacity had been identified for an additional 2tph into the bays with the current London Bridge layout. An opportunity was identified in this study to reduce the Charing Cross lines east of London Bridge from 3 to 2, allowing the approach to the London Bridge bays to increase from 3 tracks to 4. West of London Bridge the Charing Cross lines already reduce to 2 tracks, therefore the Charing Cross service changes can theoretically be timetabled, although there may be performance impacts and this may require digital signalling. This enhancement could potentially enable an additional 2tph (up to a total of 24 tph) into the London Bridge bay platforms, with a timetable recast. Additional work is required to understand the impact of performance and engineering access on Charing Cross services as well as to establish infrastructure feasibility.

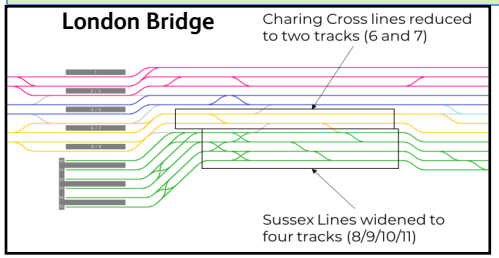



*Figure 37: Diagram showing possible future London Bridge track layout.*

# The Strategy: Interfaces & Projects

**Status: Pre– Strategic Outline Business Case**

| Consider for development | Challenging | Very challenging |
|---|---|---|

## London Bridge Area Capability (F)

### Cannon Street Junction Remodelling — LBG Capability: +4tph

The approach from London Bridge into Cannon Street is limited by being 3 tracks. Capacity analysis identified an opportunity to enhance Borough Market Junction and make a 4 track approach, with all services into and out of Cannon Street making 'parallel moves' over this enhanced junction. This would help to better balance platform usage at the terminal, and reduce conflicting moves. This is entirely segregated from the Thameslink lines.

The feasibility or constructability of this layout cannot yet be confirmed. Nevertheless, if possible, this could increase terminating capacity at Cannon Street without building additional platforms.

**N.B.** Of the 26 trains per hour, only 4 would be able to call at London Bridge in the counter peak direction.

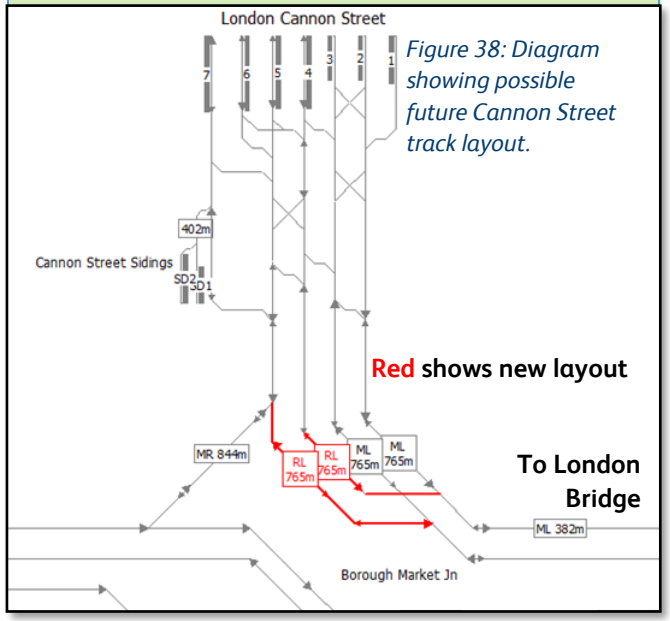



*Figure 38: Diagram showing possible future Cannon Street track layout.*

### Blackfriars Expansion — LBG Capability: +4-8tph

At Blackfriars there are redundant bridge pillars could be used to support new platforms.

Demand projections would direct additional capability towards London Bridge as opposed to towards Elephant & Castle allowing up to 4-8 more services through London Bridge. This would, however, require wider station remodelling and signalling enhancements and could affect the ability to operate both London Bridge and Elephant & Castle route services through the 'Core'.

A property development on the bank of the River Thames south of Blackfriars limits the flexibility of terminal expansion, and may mean any new platforms have to be 8-car rather than 12-car. This is likely to be the maximum length for the foreseeable due to the complex nature of the layout in the Herne Hill area.

### Charing Cross Expansion — LBG Capability: +4tph

Increasing the frequency of services through London Bridge (in order to reach Charing Cross) presents significant performance challenges.

Operational constraints aside, space around Charing Cross is severely limited, with no space to extend east or west due to listed buildings. Additionally, any expansion would impact the Jubilee Footbridges. Any feasible expansion found at Charing Cross is likely to only accommodate one additional platform.

The Kent Route Study proposed closing Waterloo East and providing a station similar to Blackfriars which straddled the River Thames. This could potentially provide more capability, but would still be restricted by London Bridge throughput, particularly if London Bridge Bays Remodelling is enacted, reducing the number of Charing Cross lines.

### Waterloo East Expansion — LBG Capability: +4tph

Expansion of Waterloo East is limited by the proximity of listed buildings, conservation areas and highways. It is likely that only one additional track could be installed, requiring the viaduct to be extended. Operationally, the route to Charing Cross is constrained from London Bridge meaning any additional services may have to be routed from London Bridge either via the Thameslink platforms, or further squeezed through the Charing Cross service platforms. Both of these result in significant performance risks.

### Cannon Street Expansion — LBG Capability: +4tph

The potential for additional platforms at Cannon Street was explored. Possible locations were identified within the station footprint on both the west and east sides. However, this would likely affect the listed station towers, require widening of the bridge over the River Thames, and still be limited by the approach routes from London Bridge. To maximise the use of possible new platforms, station and throat remodelling would be required.

Physical expansion of Cannon Street is therefore severely limited.

### London Bridge Expansion — LBG Capability: +0tph

Providing additional platforms at London Bridge is significantly challenging due to the surrounding listed buildings and structures, such as Guys Hospital and the railway viaduct. Extension to the north would impact Tooley Street and significantly affect signalling, knocking onto significant track changes. Physical expansion of London Bridge is therefore severely limited.

# The Strategy: Interfaces & Projects

**Status: Strategic Outline Business Case underway**

## Freight Interaction (Including London Rail Freight Strategy Outputs) (T, R, S)

The London Rail Freight Strategy (LRFS) (Published 2021 LINK) identified a range of enhancement options for funders for how to improve the freight capacity of London's rail network, but also improve the capability of London's orbital routes more generally. This included the West London Line and South London Line, both of which were expected to see significant growth in passenger and freight demand. The relevant core interventions identified from the study are shown in table 33.

One of the core interventions includes **relocation of the AC/DC power supply change over** from North Pole Junction to Shepherd's Bush. As of Dec-19, GTR services, call at Shepherd's Bush, depart and then stop again at North Pole Junction to changeover power supply. This extends the journey times of services and uses space in the timetable that would otherwise be available.

Moving the AC/DC changeover to Shepherd's Bush would allow the power changeover to happen at the same time as the station call, therefore saving time. By aggregating the benefits of each service, it is estimated that between 3.5-7 minutes could be saved each hour, enough to release 1-2 additional paths for passenger or freight.

**Clapham Junction platform 0** would benefit both passenger services and freight services. As of Dec-19, peak-time London Overground operations were split between two sides of Clapham Junction due to lack of infrastructure capability at platforms 1 & 2. This causes confusion for passengers, and restricts service growth from the South London Line. Additionally, use of platform 17 restricts increase of freight and passenger movements between the West London Line and Sussex network. A further, lower cost, capacity measure at Clapham Junction would also include allowing Overground services to turnback in platform 16, which would require a signalling upgrade, but would create operational flexibility.

**Angerstein Wharf:** A new chord is proposed for the Angerstein Wharf branch, near to Charlton station, which would see freight services operate to Lewisham via the short route via the Charlton-Blackheath Line, instead of routing through Abbey Wood and Sidcup, which is necessary due to the current Angerstein Wharf junction facing east. This would not only save infrastructure wear and reduce fuel consumption, but it could also benefit passenger services by freeing up capacity via Abbey Wood and Sidcup.

*Table 33: Summary of London Rail Freight Strategy recommendations in the South London study area.*

| West London Line AC/DC changeover relocation | Clapham Junction platform 0 | North London Line, Gospel Oak Barking Line, and West London Line headway reductions |
|---|---|---|
| Extension of the overhead wires further along the West London Line to provide AC electrification as far south as Shepherd's Bush station | Creation of an additional bay platform capacity at the northern end of Clapham Junction station for the use of London Overground West London Line services. | These are improvements on which the London Rail Freight Strategy is dependent, but are expected to be realised through wider enhancement programmes, so are not directly proposed by the LRFS. |

### Passenger growth & freight growth

The proposed growth of passenger services identified throughout the South London & Thameslink Study may not be entirely compatible with forecasted freight growth. The differences between the off-peak passenger services used for the LRFS and the peak passenger services identified in the SL&T are shown below:

*Table 34: Comparison of future South London peak passenger frequencies and the frequencies assumed in the LRFS.*

| Passenger Service Frequencies | LRFS Off-peak 2040s | SL&T Peak 2040s (Do Mid) | Peak only |
|---|---|---|---|
| Clapham Junction—Stratford | 6 tph | 6 tph | 0 tph |
| East Croydon—Watford Junction | 2 tph | **4** tph | +2 tph |
| Clapham Junction—Dalston Junction | 6 tph | 6 tph | 0 tph |
| London Victoria—Lewisham (Kent Metro) | 4 tph | 4 tph | 0 tph |
| London Victoria/Blackfriars—Kent Mainline via Denmark Hill | 1 tph | **5** tph | +4 tph |
| London Blackfriars—Orpington/Sevenoaks | 4 tph | 4 tph | 0 tph |
| London Blackfriars—Lewisham (Kent Metro) | 0 tph | **2** tph | +2 tph |

To protect freight growth, additional services required at peak times may provide connectivity that is not provided off peak. For example, as 4tph would likely only operate in the peak between the West London Line and Sussex Metro area, it is likely preferable these all focus on one corridor in South London, to avoid having a peak only service. For this service to operate to two corridors all day, paths for 4tph would need to be identified, which may have to come at the expense of reduced TfL Overground services, or reduced freight.

**'Express freight'** is a concept which could see lighter weight, higher speed, higher frequency services operate directly into urban logistics hubs, such as terminal stations. This would support freight decarbonisation in London, and changing socio-economic trends, such as same-day delivery. Whilst planned for London Liverpool Street, express freight proposals aren't currently being developed for the Southern Region's terminals, however, it is certainly a future possibility.

# The Strategy: Interfaces & Projects

## Rolling Stock Requirements (A, Ai)

Using the ITSS scenarios it is possible to **estimate** the number of additional vehicles and units which will be required by 2050. The table below summarises the vehicle and unit requirements for each service group.

Using an assumption that the vehicle length is 20m, a total of 2,420m of stabling may be required for unit lengthening. Furthermore, by 2050, between 10,880m and 21,180m of extra stabling may be required for Do Min (medium post-COVID) to Do Max (pre-COVID) ITSSs respectively.

Many depots are severely constrained. For example, there are capacity concerns at Slade Green (with only 3x12-car sidings), and Gillingham is not capable of handling 12-car rolling stock. Other depots, such as Selhurst and Stewarts Lane have some opportunity for capacity enhancements, but these do not entirely remove stabling as a constraint.

In addition to current capacity, new sites across Sussex and Kent were identified with capacity for up to 712 vehicles, including potentially a new depot at Hoo Junction. Whilst this theoretically covers medium post-COVID up to 2050, non-London services are not included, and the aggregated nature of these figures means the location and size of the depot opportunity may not mirror the location and size of the service growth. Furthermore, any growth above medium post-COVID will certainly require more depot provision beyond currently identified.

**New Rolling Stock:** A mix of 8-car, 10-car and 12-car rolling stock is required for future South London Metro services. Ideally these would be Class 700 style with selective door opening to maximise capacity. A mixture of 4-car and 6-car component units would allow all necessary formations including reduced lengths at quiet times.

Passengers value onboard comfort, so toilets, Wifi and power should be all be provided, as well as sufficient flexible space for luggage, bikes, prams and wheelchairs. Standardised rolling stock also creates an opportunity for improved accessibility allowing the platform infrastructure to be specifically designed for the rolling stock.

**Tactical Lengthening Readiness:**

**Kent:** The Kent Route Study (2018) identified a number of signals, primarily in the Slade Green to Crayford area, which would require relocating for more 12-car Metro operation on the Kent Metro. These would also immediately support performance improvement.

**Sussex**: Secondly, whilst 10-car services operate on the Sussex Metro to stations with platforms shorter than 10-car, a future standardised 10-car rolling stock operation would benefit from more platforms being extended where feasible. This is explored on page 67.

*Table 35: Possible rolling stock requirements up to 2050 under different ITSS and COVID scenarios*

| Service | Vehicles to lengthen to max length (May-19) | Additional full length units requirement by 2050 | | | |
|---|---|---|---|---|---|
| | | Do Max ITSS (pre-COVID) | Do Min ITSS (pre-COVID) | Do Max ITSS (Medium post-COVID) | Do Min ITSS (Medium post-COVID) |
| | Based on max length for route constraints | | | | |
| **Sussex Metro (VIC + LBG)** | +16 vehicles | +5 (10-car) | +5 (10-car) | +5 (10-car) | +5 (10-car) |
| **Blackfriars (via Elephant & Castle)** | 0 | +12 (8-car) | +15 (8-car) | +12 (8-car) | +16 (8-car) |
| **Kent Metro (LBG)** | +82 vehicles | +10 (12-car) | -5 | +5 (12-car) | -5 |
| **Kent Metro (VIC)** | 0 | +9 (8-car) | +4 (8-car) | +9 (8-car) | +4 (8-car) |
| **Orbital** | 0 | +9 (8-car), +21 (5-car) | +9 (8-car), +21 (5-car) | +18 (5-car) | +18 (5-car) |
| **Sussex Mainline (LBG)** | +2 vehicles | +4 (10-car), +12 (12-car) | +4 (10-car), +12 (12-car) | +4 (10-car), +8 (12-car) | +4 (10-car), +8 (12-car) |
| **Sussex Mainline (VIC)** | +4 vehicles | +12 (12-car) | +12 (12-car) | +4 (12-car) | +4 (12-car) |
| **Kent Mainline (LBG)** | +12 vehicles | +18 (12-car) | +14 (12-car) | +10 (12-car) | +10 (12-car) |
| **Kent Mainline (VIC)** | +5 vehicles | +0 | +2 (12-car) | +0 | +0 |
| **TOTAL** | **+121 vehicles** | **+112 units (+1059 vehicles)** | **+93 units (+839 vehicles)** | **+75 units (+672 vehicles)** | **+64 units (+544 vehicles)** |

*Includes +20% sensitivity for Metro services to account for origin flexibility. 0% error for Mainline services as based on doubling peak hour arrivals, one unit per arrival. Metro figures valid for peak and off-peak. Mainline based on 2-hour peak. **METRO**: LBG Kent 12-car, VIC Kent 8-car, BFR 8-car, VIC Sussex 10-car, LBG Sussex 8-car (TUH) & 10-car (NXG). **MAIN**: LBG Kent 12-car, VIC Kent 8-car (DMK, MDE) & 12-car, LBG/VIC Sussex 10 (SUO, TAT, CAT, UCK) & 12-car*

# The Strategy: Interfaces & Projects

**Status: Pre– Strategic Outline Business Case**

## Platform Extensions (linked to A)

Maximising the length of rolling stock for the infrastructure is the first logical step to increase capacity. However, following that, the choice becomes increasing frequency or providing infrastructure for further lengthened rolling stock.

Apart from tactical platform extensions, the general preference identified throughout this study is for increased frequencies. Lengthening rolling stock only provides for additional capacity, but higher frequencies also reduces the 'generalised journey time' for passengers, as there is, on average, less waiting at stations. Increased frequencies attract more passengers onto the network, therefore being more successful in encouraging modal shift.

Fundamentally, each of the routes out of Victoria and Blackfriars are faced with highly complex platform extensions, at stations such as Balham, Herne Hill, Elephant & Castle, Tulse Hill and Peckham Rye. The costs to extend these platforms is significant, so opportunities to increase frequencies, and bring further benefits, should be exhausted first. As such, stopping services via Elephant & Castle and Herne Hill will remain 8-car for the foreseeable future.

Opportunities for platform extensions do however exist. As the strategy for the Sussex Metro services from Victoria is to operate full 10-car rolling stock, the stations that would benefit from 10-car platform extensions include: Epsom Downs, Epsom, Ewell East, Hackbridge, Mitcham Junction, Carshalton Beeches, Clapham Junction and Battersea Park. These are predominantly low to medium complexity.

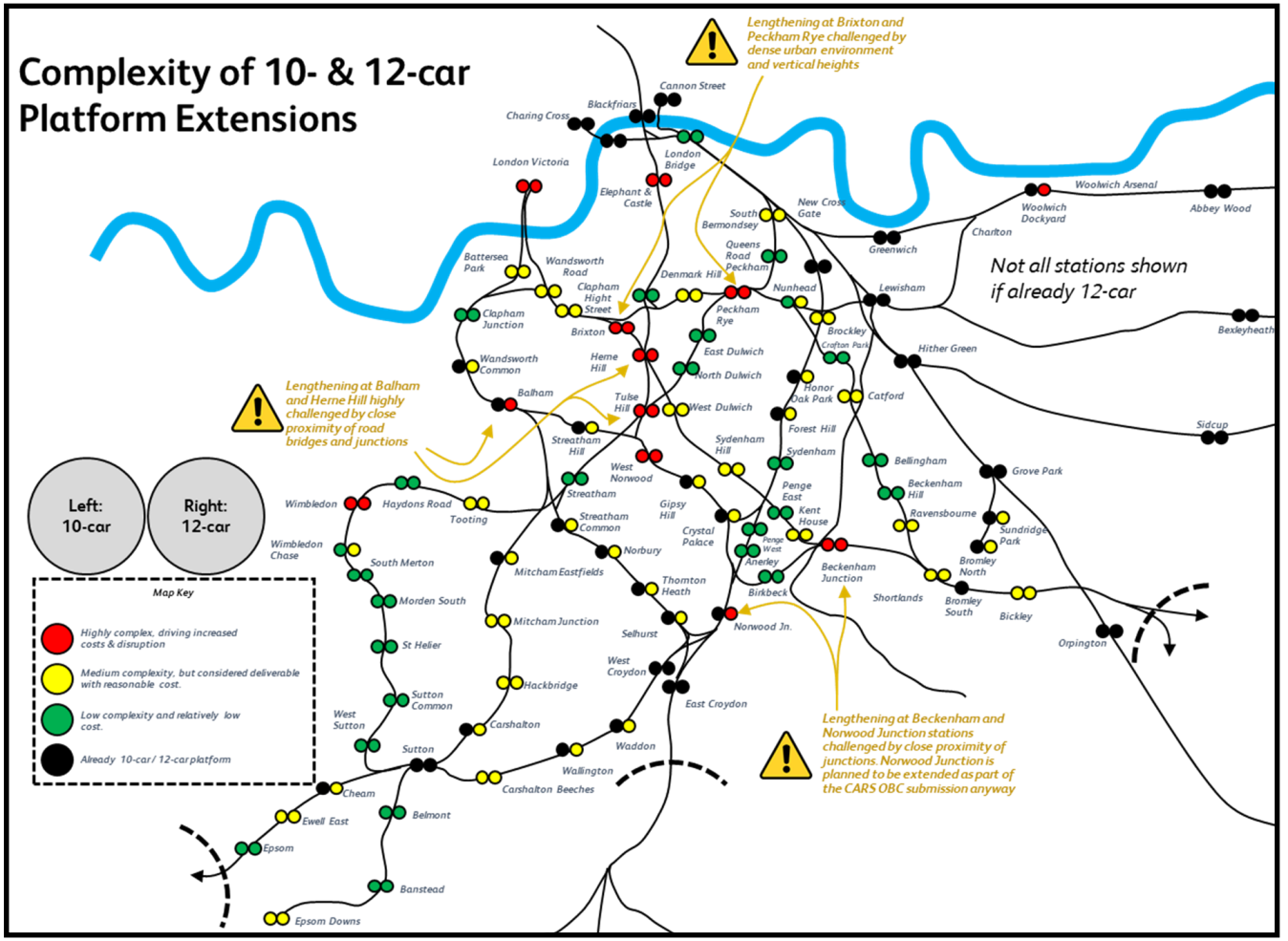



*Figure 39: Map showing complexity of extending existing platforms to either 10-car or 12-car.*

**Selective Door Opening (SDO):** SDO is a method of calling services at stations where the platforms are too short and the train overhangs. SDO allows only the doors against the platform to open, but is only possible on rolling stock with this functionality (such as Class 375s, 377s and 700s, but not Class 455s or 465s). SDO is only permittable at stations where the risk is deemed acceptable, and so should not be recommended for particularly crowded stations. It may be allowable where there is only limited overhang or at quieter stations.

In general, this study does not recommend selective door opening as a long term strategic recommendation due to the significant performance risk and impact to passenger experience.

# The Strategy: Interfaces & Projects

**Status: Pre– Strategic Outline Business Case**

## Performance (Q, V)

Operating additional services through congested locations, such as Herne Hill, Balham Junction, and Lewisham will rely on operational performance being consistently high. Network Rail and Train Operating Companies are constantly exploring how performance can be improved. Some key factors include:

**Rolling Stock:** Faster accelerating and braking rolling stock, with wide doors which open and close quickly and passenger circulation space, help to reduce the rolling stock impact on performance. Passengers can board and alight quicker, and a swifter arrival and departure from stations can be achieved.

**Timetabled 'performance' time:** A key theme on Thameslink services is 1-minute performance time added into the timetable on either side of the Core. This provides a space for any minor delays gained to be absorbed, therefore increasing the likelihood that the Thameslink service presents on time at the Core.

**Extended station dwell time:** At Denmark Hill and Nunhead, all Thameslink services must have a 1-minute dwell, whereas Southeastern or TfL Overground services have 30 seconds. This reduces the impact of station dwell on Thameslink reliability, and helps to absorb any sub-threshold delay gained prior to the station before entering the 'Core'. However, it is not ideal as it extends journey times and reduces track capacity. Platform staff can also manage passenger flows, improving performance and mitigating the need for extended dwells.

**Infrastructure:** Performance is often affected by train-on-train interactions which occur when trains share the same track. Poor performance is often exacerbated at flat junctions or locations with high throughput. Grade separating junctions, building passing loops, and additional track can deconflict trains and contribute to improved performance.

**Enhanced Signalling & Digital Signalling:** As explored to the right, improved signalling and reduced planning headways provides more 'white space' in the timetable, therefore reducing the knock-on impact one service has on a following service. It also provides drivers with advanced warning of signal aspect, allowing them to react earlier.

**Depots:** For services to start each day without delay it is vital that the depot also operates reliably. This means trains are serviced, well maintained, and in the right formation and that checks are done and the unit is ready for drivers. Mobile maintenance teams from depots can also quickly reach units suffering from issues out on the network.

**Station Starts:** Many services are delayed even before they leave their origin station. Apart from the generally congested infrastructure around London terminals delaying other services, origin stations in London often represent the point on the service where the most people join the train. This can lead to dispatch delays, as the train cannot depart until it is safe to do so. At origin stations it is sometimes stated that train doors will close a certain time before planned departure to increase the likelihood of an on-time departure. Station crowding can also contribute to poor train performance.

**Asset Reliability:** Signalling and track present performance and reliability risks for future services unless regularly maintained, renewed and enhanced where necessary.

## Digital Railway & Signalling (D, L, M, S, W, Ai)

A key theme in maximising capability from the existing infrastructure is to upgrade the signalling for shorter 'headways' - the minimum space permitted between successive train paths. This study has identified the following locations where this could be of value:

*Table 36: Likely required headway reductions on routes in South London*

| Route | Headways (Dec-20) | Desired Headways (dep. to dep.) | Demand req. |
|---|---|---|---|
| i: Sydenham Corridor | Fast: 2, Slow: 3.5 | Fast: 90s (24tph+) Slow: 2.5 | 2020/30s |
| ii: West London Line | Fast: 3.5, Slow: 4 | All: 3 | 2020/30s |
| iii: Willesden Junction area* | Junction margin: 2.5*, Headway: 3* | Junction margin: 2*, Headway: 2* | 2020/30s |
| iv: Sutton—Streatham South Junction | Fast: 2.5, Slow: 4 | Fast: 2 Slow: 3 | 2020/30s |
| v: Wallington Line | Fast: 2.5, Slow: 4.5 | Fast: 2 Slow: 3 | 2030/40s |
| vi: Balham Jn—Clapham Jn Slow Lines | All: 3 | All: 2.5 (18tph+) | 2030/40s |

*Headways in Kent and Sussex are applied on a depart-to-depart methodology, whereas on the Anglia route they are applied on a depart-to-arrive methodology. Willesden Jn area is based on depart-to-arrive.

Firstly, shorter headways allows more 'white space' in the timetable which is valuable for protecting performance. Secondly, they can allow services to operate closer together which can increase the number of train paths available. Finally, they can allow fast services to operate with shorter journey times in between slow services, as they can depart later and catch up more closely to the preceding slow service (as shown on page 53).

As signalling is renewed, there is an opportunity to install digital signalling, which transfers the signalling from lineside to in-cab, providing the driver with advanced notice of the signal aspect, reducing signal sighting issues, and generally helping to improve reliability. This would be particularly beneficial between Hither Green, Lewisham and Charing Cross / Cannon Street, as well as through Herne Hill and along the South London Line. Digital signalling can also be used as part of Automatic Train Operation, which allows trains to operate more reliably in close succession with consistent operational performance.

Additionally, a review and upgrade of signal sighting for 12-car Class 700s on the Greenwich Line will also be necessary. This could be supported by ETCS, removing signal sighting issues.

Improved signalling is not necessarily a standalone project, and in many cases will be linked to other capability improvements. For example, ii & iii will be linked to West London Line capability improvements, and iv & vi to Victoria enhancements. Similarly, i, v & vi and will be higher priority if linked to London Bridge area enhancements.

The Kent Route Study (2018) also identified a number of signals, primarily in the Slade Green to Crayford area, which would require relocating for more 12-car Metro operation on the Kent Metro. These are required as soon as possible to support performance.

# The Strategy: Interfaces & Projects

## South London Line Flexibility (I)

**Status: Pre– Strategic Outline Business Case**

The South London Line will become an even more strategically important artery, with forecast increased freight and passenger movements. It is therefore vital that the performance of services is high. Currently, there is one link between the Atlantic Line and Catford Loop Line (Crofton Road Junction), making this location a performance risk hotspot. Providing another crossover opportunity would increase the flexibility of the infrastructure by providing more routing opportunities and timetable flexibility.

Line speed enhancements have also been explored for the Ludgate Lines, between Wandsworth Road and Clapham Junction. TfL Overground and freight services use these lines, and an enhanced line speed could deliver a journey time improvement of around 50 seconds, helping to improve performance. Signal spacing will be improved in the area through the Victoria Phase 5 Resignalling Project to prepare for the speed enhancement. Further funding will be required to continue to develop this line speed enhancement scheme.

Additionally, new turnback opportunities would allow services to partly operate during engineering works, and therefore maintain connectivity to key destinations such as Denmark Hill (and Kings College Hospital) and/or Peckham Rye. Turnbacks could also allow for quicker service recovery during disruption.

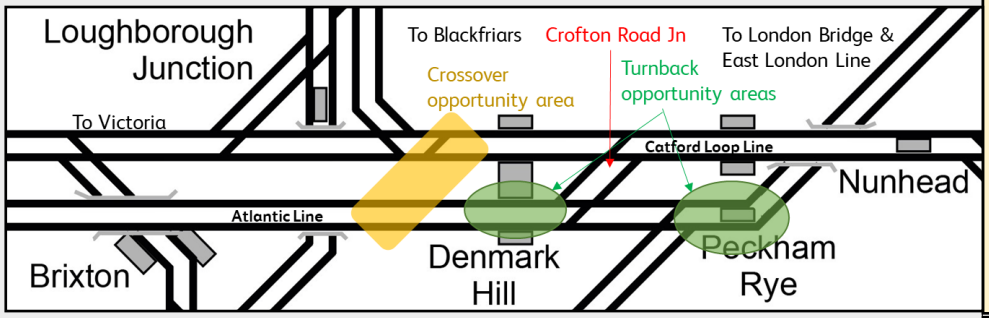



*Figure 40: Possible future enhancement on the South London Line*

## Third Rail Power Enhancement

Any new or lengthened rolling stock, or increase in frequencies requires a review of the power capability of the electrified network. The third rail system is generally sized to meet the current rail service so the power supply has to be bolstered to cope with new demand. Historically, power supply upgrades have been delivered on a piecemeal basis to address short-term problems, rather than on a strategic long-term basis. Over the past few years, Network Rail has invested in power supply enhancements on the Kent Metro routes. Power upgrades on the Sussex network last occurred during the Thameslink Programme.

Network Rail is planning to launch a power modelling exercise covering all the Kent and Sussex routes. This will take into account future service growth projections for both passenger and freight, rolling stock lengthening and upgrades to establish the priority locations for power enhancements.

## Kent House—Penge East Loops (P)

Whilst **not recommended as an immediate priority** for development, in order to maintain fast Mainline service journey times between Kent and Victoria, it may become necessary to construct overtaking loops in the vicinity of Kent House and Penge East. This was initially identified by TfL as part of their Metroisation proposal, as it allows both Metro and Mainline service frequencies to increase, but without a journey time penalty of +5 minutes to Mainline services. The economic analysis behind this is explored on page 52. Should Mainline expansion into London Bridge not be feasible, then the priority of developing the Kent House—Penge East Loops will increase in priority.

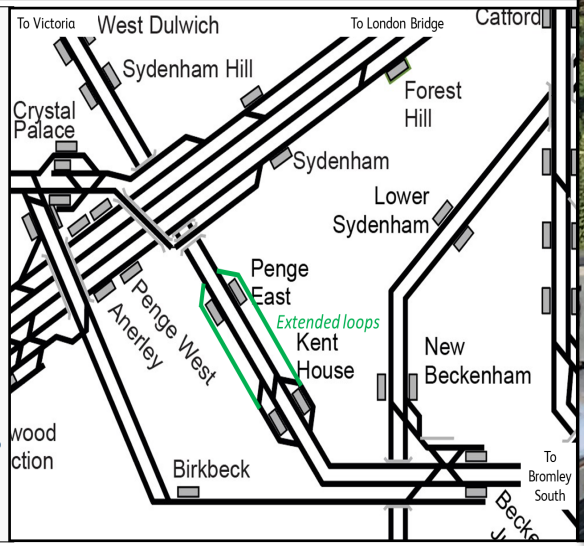



*Figure 41: Track diagram showing potential new overtaking loops between Kent House and Penge East*

**Status: Pre– Strategic Outline Business Case**

# The Strategy: Interfaces & Projects

## Herne Hill Small Layout Enhancement (N)

This enhancement of the track layout at Herne Hill is only necessary if services start operating between Victoria and the Sussex Metro area (i.e Sutton, Norbury, Crystal Palace), via Herne Hill. The reasons for this service to be implemented include: combining increased capability on Sussex Metro and Kent Metro with fewer additional services, reducing increased pressure between Clapham Junction and Balham, increasing capability through Herne Hill with fewer conflicting moves, and with less impact to Kent Mainline services.

However, the new service from Victoria to Tulse Hill would ideally conduct 'parallel moves' with a Blackfriars to Beckenham Junction service. This would require a small section of additional track to be installed to allow simultaneous departures from the southbound platforms.

Initial feasibility work conducted has been conducted by Network Rail with early estimates suggesting a likely positive benefits/cost ratio with higher post-COVID recovery.

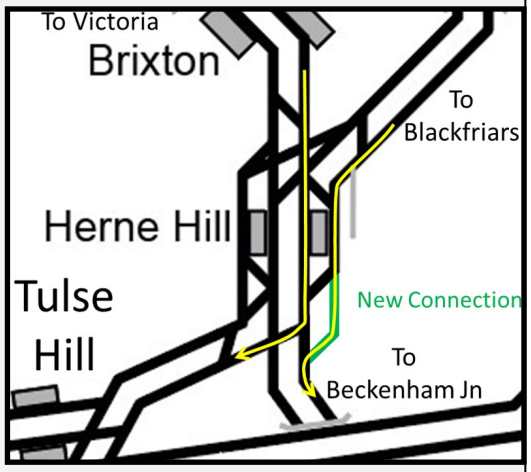



*Figure 42: Track diagram showing potential new Herne Hill parallel connection*

**Status: Pre– Strategic Outline Business Case**

## Hither Green Area Capacity Options (U)

**Status: Pre– Strategic Outline Business Case**

The Hither Green area presents a significant constraint to increasing frequencies. As the map below shows, a Lee to Lewisham services (**orange** line) conflicts twice with a southbound London Bridge to Hither Green Metro service (**blue** line). In addition, any service between Hither Green and Charing Cross/Blackfriars/Victoria has to be precisely timed around Hither Green, Courthill Loop Junction, Lewisham Crossover Junction, and Lewisham Vale Junction (all highlighted in red). As such, the timetable is highly constrained.

In a Do Max and Do Mid ITSS, a total of 10tph on the slow lines could operate between Hither Green and Lewisham, along with another10tph from Hither Green avoiding Lewisham. This includes 4tph between Grove Park and Lewisham. This 20tph is an increase from 15tph. In Do Min and lower post-COVID recovery options frequencies increase to 18tph.

**Option 1:** In theory **a new timetable structure** could be developed which can accommodate the full 20tph Metro frequency north of Hither Green without requiring additional infrastructure, if specifically pivoted around these constraints. However, this presents reliability concerns, and the pattern of services between Lewisham and London Bridge are timetabled across Tanners Hill junction in a way which could limit other Charing Cross Mainline and Metro frequencies.

**Option 2:** Should the rigidity of this new timetable structure be undeliverable it may be necessary to **remove a key infrastructure constraint** in the Hither Green / Lewisham area, to provide required flexibility by removing one of the fixed points.

This has not been explored from an infrastructure feasibility perspective, but is likely to be significantly challenging.

**Next steps:** In the shorter term, redistribution of existing capacity may be the most efficient method of delivering increased capacity between Hither Green and Lewisham. Development of a 'South London 2050 timetable' will be able to confirm whether this rigid timetable structure can be integrated into the wider long term timetable changes and if not the changes that need to be made or trade offs required.

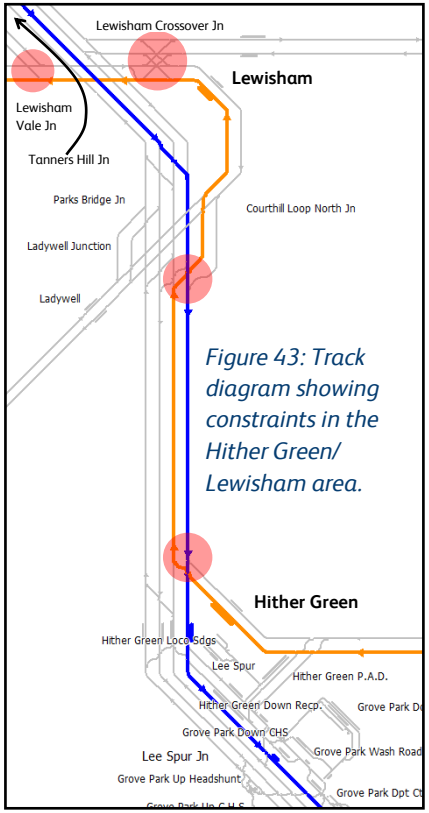



*Figure 43: Track diagram showing constraints in the Hither Green/ Lewisham area.*

# The Strategy: Interfaces & Projects

**Status: Pre– Strategic Outline Business Case**

## St Mary Cray Junction Enhancement (J)

Linking the Chatham Mainline to the South East Mainline, St Mary Cray Junction is not optimised for increased frequencies. Currently, bi-directional train movements are common which restricts capability and threatens performance. Improving this junction will be vital in increasing frequencies significantly between Medway, Maidstone and London Bridge.

## Tonbridge—Orpington Capacity (Incl K)

Due to the mix of slow and fast services on the South East Mainline, the section between Tonbridge and Orpington is considered 'at capacity' with the Dec-19 timetable. Increased frequencies could depend on changes to stopping patterns or/and potential 3-4 tracking. This will be a key interface with any London Bridge expansion development.

## Wider Sussex route interventions (Incl G)

More enhancements will likely be necessary on Sussex routes with further increased frequencies under most post-COVID scenarios in the longer term. These include resolving constraints such as junctions at South Croydon, Stoats Nest and Keymer. It could also include turnback enhancements.

## North of the River Thames

*Table 37: 8-car Thameslink services that operate from the South London Metro network through 'the Core'. Rainham service highlighted as likely required to be 12-car in future*

| 8-car Thameslink Services | | | | |
|---|---|---|---|---|
| **South of the Core (Peak)** | **2020s** | **North of the Core (Peak)** | **2020s** | **Notes** |
| Wimbledon Loop | 4tph | St Albans (stopping) | 4tph | Calls at Cricklewood in off-peak and peak period Northbound |
| Sevenoaks | 2tph | Welwyn Garden City | 2tph | |
| Orpington | 2tph | Luton | 2tph | Calls at Cricklewood southbound in peak periods in place of Wimbledon Loop services |
| Rainham | 2tph | Luton | 2tph | |
| **Rainham service would ideally be lengthened to 12-car in the future* | | | | |

| 8-car constraints north of the Core | |
|---|---|
| Cricklewood platforms | St Albans turnback |
| Kentish Town platforms | All platforms north of Finsbury Park to Welwyn Garden City |

As of Dec-22, there will be 10x 8-car services linking South London to north London. Whilst the Wimbledon Loop, Sevenoaks and Orpington services will remain 8-car for the foreseeable future. This study has identified that the Rainham Thameslink service should be lengthened to 12-car to deliver increased capacity along the Greenwich Line.

Whilst this would not be an issue for most of the day, the Rainham service makes southbound calls at Cricklewood in the peak period. As these platforms are 8-car, stopping a 12-car service would not be possible without SDO. The Wimbledon Loop service primarily serves Cricklewood, but does not in the peak to allow sufficient turnaround time at St Albans. Rectifying this, which may include providing an additional driver, and shortening turnaround times, would be key in allowing the lengthening of the Rainham services to take place.

In considering the timescales for 12-car introduction on the Greenwich Line, particularly in lower post-COVID scenario, it may be likely that by the late 2020s/early 2030s, the Midland Mainline may also see larger scale timetable changes, allowing the requirement for 12-car Greenwich Line services to be specified in the timetable design process.

This will also require a review of signal sighting for 12-car Class 700s on the Greenwich Line, and any resulting signal enhancements.

# The Strategy: Interfaces & Projects

Status: Pre– Strategic Outline Business Case

## New Terminal & Railway Opportunity (Linked to F & H)

Given that enhancing current highly constrained infrastructure may bring significant cost, the economics of brand new infrastructure may compare favourably in the long term.

An option, explored at a very high level, is for a new terminal serving Canary Wharf, one of the fastest growing areas of job growth in London. This could see the South London rail network directly serve the Canary Wharf area, reducing pressure on travel via central London. Tunnels would be bored from the Brighton Mainline and the South East Mainline, under the Thames into a new subterranean station serving the Canary Wharf area. This could even be extended further to form a new 'Crossrail', connecting with other radial routes into London.

A new subterranean railway could, in theory, entirely remove interaction between Mainline and Metro services in South London, at locations such as Herne Hill, and provide vastly more track capacity. This could significant improve Mainline journey times, and allow for considerable increase in Metro frequencies. It would result in a 4-track Metro railway into Victoria and London Bridge, leading to further journey time benefits for Kent and Sussex.

**A proposal of this scale would drive considerable cost**, although it could also bring substantial benefits if considering it as part of a much larger regional scheme.

This study has demonstrated that there are opportunities to alter and enhance the current service and infrastructure and so **efforts to exhaust remaining opportunities at London Victoria, London Bridge, and along the lines of route, should be maximised before developing a scheme of this scale**. However, when growth trends are demonstrating future passenger demand greater than capacity that can be delivered in existing rail corridors, a new railway to take Mainline trains to/from central London under South London to Croydon and the south may be required to accommodate additional South London Metro trains. It could also deliver a step change in the quality of the South East's rail service.

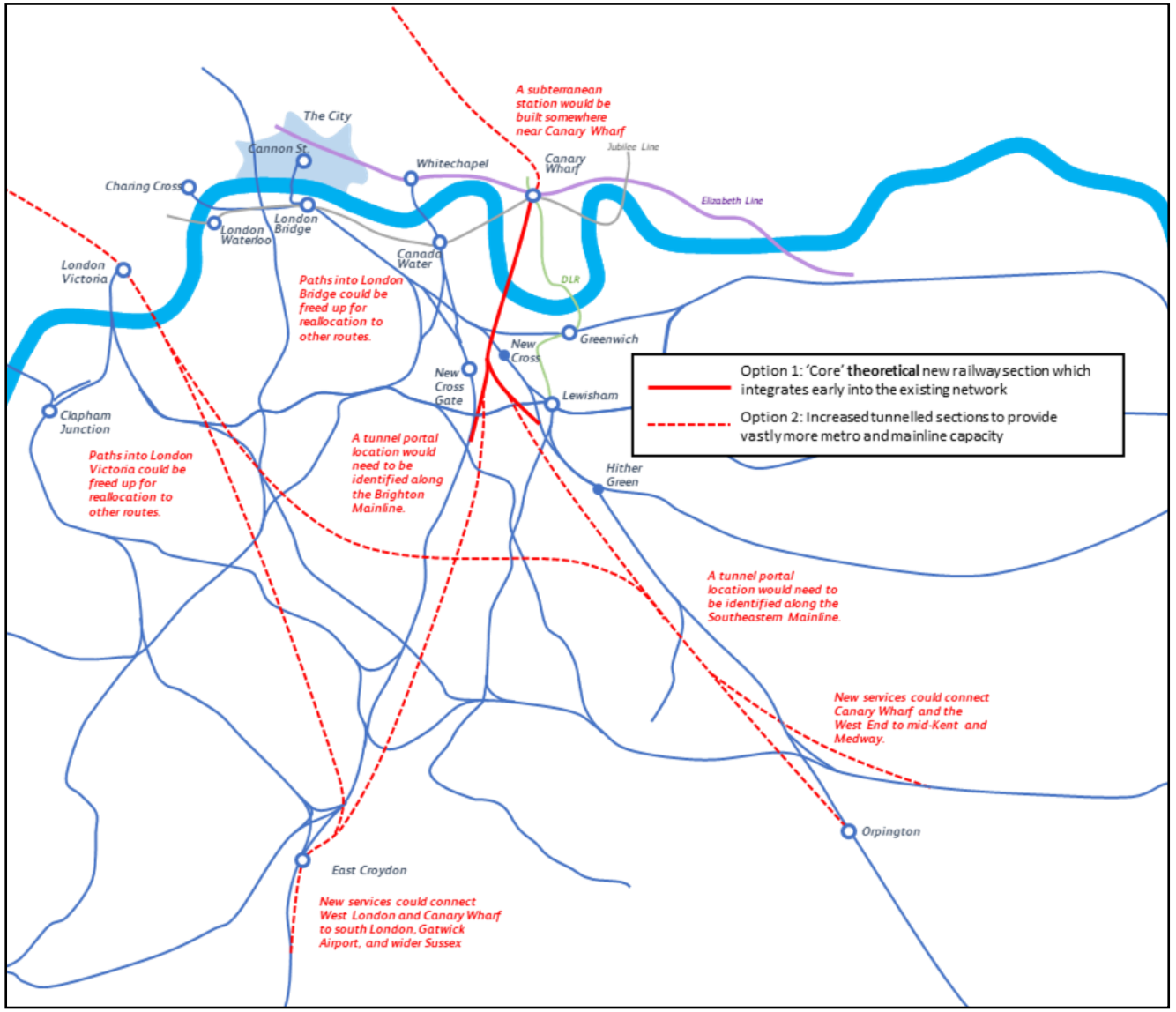



*Figure 44: Track diagram showing theoretical new railways in South London to vastly increase capacity and improve journey times. This is just illustrative and does not represent any scheme in development.*

# The Strategy: Interfaces & Projects

## Orbital Connectivity

Orbital connectivity is principally challenged due to the disjointed network. Ideal interchange stations are also generally in central London. Therefore rail is not always the best solution to the orbital connectivity issue. Nevertheless, there are numerous ways it could potentially be improved:

*Table 38: Opportunities to improve connectivity*

| Enhance the current service | Provide new services | Provide new interchanges / railways) |
|---|---|---|
| **Increasing frequencies:** Increased frequencies reduce generalised journey times, providing more journey opportunities and making orbital connectivity and interchange easier and quicker. Increasing frequencies, particularly in the peak, is heavily reliant on increasing terminal capability. | **Blackfriars—Lewisham—Kent Metro:** This service, suggested in this study would provide new connectivity between stations in the Kent Metro area and Peckham Rye / Denmark Hill, as well as interchange onto the Bakerloo Line at Elephant & Castle. | **Turning a current station into an interchange station:** Stopping services that currently pass through certain stations could provide more interchange opportunities. One example is Clapham High Street, where Victoria—Lewisham services could potentially stop in the future and provide a connection to Clapham North Underground station. (Explored more on page 80) |
| **Reducing journey times:** Headway reductions could release additional capacity and improve connectivity. New rolling stock could help enable these benefits. | **West London Line—Streatham Hill/ Crystal Palace—Beckenham Junction:** Should additional all day paths be found from the West London Line to Sussex Metro area, then a new service could link the Chatham Mainline at Beckenham Junction with Clapham Junction and the West London Line. This may also require larger scale infrastructure such as junction grade separation. | **Providing new interchange stations:** TfL Metroisation identified the opportunity for an interchanges at Streatham and Brockley. New platforms would allow more services to stop, increasing interchange opportunities. Brockley High Level is explored more on page 79. |
| **Improving current interchanges:** Current interchange may be unattractive to passengers because of poorly designed stations. Redeveloping Lewisham and Peckham Rye would help to reduce the pressure of interchange on the station and make it a more pleasurable experience for passengers. | **Victoria—Brixton/Herne Hill—Sussex Metro:** The 'Do Min' ITSS option identifies the opportunity to link crowded parts of the Kent and Sussex Metro routes together to relieve crowding efficiently, but also improve connectivity, such as potentially from Streatham/ Crystal Palace to Brixton for interchange with the Underground. | **Building new railways:** Not recommended from the study, but in theory, new infrastructure could link the disjointed network. This would need to be part of a much more focused study on orbital connectivity infrastructure options. |

# The Strategy: Interfaces & Projects

## Enhanced Sunday Frequencies

As noted on page 25, the South London rail network has a reduced service on a Sunday compared to on a Saturday. This could be limited by economic, social and environmental development in London due to the reduced ability for people to travel.

As part of this study, economic analysis was commissioned to identify the economic benefits of operating a Saturday service on a Sunday across the whole Kent and Sussex networks. No capital costs were assumed, nor operational costs beyond staffing, and electric power costs were not considered in the analysis.

The analysis found that, on the whole, operating a blanket Saturday timetable across the Kent and Sussex networks does not present good value for money: the operational costs are almost, but not fully, offset by the potential benefits. However, the analysis does identify key routes which generate the most benefits. In London, the top 10 routes to offer an enhanced Sunday service are shown in the figure 45.

Due to the current reduced frequencies on a Sunday, it is the day engineering works typically take place. As a result, there is a strong relationship between enhancing Sunday services and changing engineering access regimes. During the development of this study, the following recommendations were identified through collaboration with the train operators:

1. The industry should work towards running the same level of Sunday service as Saturdays as soon as possible;
2. Ideally never disrupt trains between London and the Coast, or along the Coast between May and September, Christmas, Easter or Half Term Holidays and particularly at weekends;
3. Focus on overnight engineering works or blockades between late Sunday evening and Fridays;
4. Develop a prioritisation list for acceptable levels of disruption to different services.

Operating a Saturday service on a Sunday is not without its challenges. These are predominantly due to associated increased mileage, traincrew and station staff costs, as well as potential implications on additional maintenance access as a result of the increased tonnage.

1. Bromley North—Grove Park (currently no Sunday service)
2. Croydon—London
3. Bexleyheath Line—London
4. Dartford—London
5. Bromley South—London
6. Sevenoaks—London
7. Blackheath—London
8. Clapham Junction—London Victoria
9. Catford—London
10. Lewisham—London

*Figure 45: Services in South London that would likely generate the most benefit from improved Sunday frequency*

## Improved Journey Times to Sutton & Dartford

Journey times between Sutton and London, and Dartford and London, are comparably slower compared to other similarly distanced places around London. High level analysis has taken place to identify the potential for journey time improvements.

**Sutton—London:** Analysis found that from Sutton, it should be possible to operate services with journey times of under 30 minutes to London via Hackbridge, down from 31 minutes in Dec-19, with even more time saved if operating on the Fast Lines through Balham and Clapham Junction (Further saving of +3 minutes). The same is true for Sutton to London Bridge via Wallington Line (currently 32 minutes), which could also be brought to under 30 minutes. Both of these improved journey times would be enabled through additional services with removed intermediate calls, and shortened planning/signalling headways.

**Dartford—London:** From Dartford to London Bridge, the current journey time is 34 minutes, but could also be under 30 minutes with removed station calls, and redistribution of services. These journey time improvements would have to be part of wider timetable rewrites, and will be heavily affected by other constraints on the network, including available terminal capability.

**Trade offs:** Without significant infrastructure investment, improving journey times can therefore sometimes be counter productive, with detailed operational and economic appraisals being essential. Speeding up fast services can compromise slow services unless the services are segregated, such as through 4-tracking. For example, on the Hackbridge Line slow services to Victoria may need to operate with either a 7.5&22.5 minute interval or 10&20 minute intervals to allow an additional 2tph to operate fast. Similarly, with the Do Max ITSS on the Sidcup Line (12tph), operating 2tph non-stop and if as fast as possible, then stations such as Lee may have 5 services in 15 minutes, then no services for the following 15 minutes.

# The Strategy: Interfaces & Projects

## Interface with TfL Metroisation

As previously explained, this study complements TfL's vision for Metroisation, and provides a potential path to follow from where we are now, to almost full TfL Metroisation. Table 39 shows the similarities and differences between the December 2019 frequencies, the frequencies identified in this study's 'Do Max' ITSS (pre-COVID), and TfL Metroisation frequencies for a peak hour.

**Similarities:** It shows that there are a lot of similarities, such as total 'Kent Metro' frequency uplift into London Bridge, as well as frequencies along lines through stations such as Norbury, Grove Park, Hayes, Bromley South, and on Thameslink via Elephant & Castle. As the figure 46 shows, the Do Max ITSS capability requirement for London Bridge gets very close to that necessary for TfL Metroisation frequencies (with TfL Metroisation including Mainline uplift as used in the 'Do Max' ITSS).

**Differences:** As the South London & Thameslink 'Do Max' ITSS is bottom-up, using current and forecast demand and some connectivity aspirations, in some places the frequencies don't push as high as TfL Metroisation, or follow the exact same route. TfL Metroisation generally pushes higher on the Sussex Metro routes, and has a different pattern of services around Lewisham. This study has not considered the potential of induced growth that could result from increasing service frequency.

**Infrastructure:** There are also differences in terms of required infrastructure. For example, apart from a small enhancement at Cannon Street, and digital signalling, TfL Metroisation suggests that no additional infrastructure is required in the London Bridge area to accommodate the increased frequencies. This is particularly because 'Mainline' services do not increase in TfL Metroisation as much as in this study's 'Do Max' ITSS, and also because TfL suggest shorter turnaround times to increase utilisation of current infrastructure. This study suggests more infrastructure would be required than TfL have assumed in order operate the frequencies with suitable turnaround times and acceptable reliability. In reality, the infrastructure requirement may be somewhere in-between depending on technological advancement.

**Strategic Alignment:** It is inevitable that differences would occur between this study and TfL Metroisation—the approach to designing the ITSSs comes from different angles. Whilst this study's end state vision may be the final step prior to TfL Metroisation, the priorities for short-medium term investment are well aligned, and prepare the network for a wide range of future scenarios.

*Table 39: Comparison between Dec-19 service, this study's 'Do Max' spec, and TfL Metroisation spec for the **peak hour**.*

| Line | | Dec-19 | South London & Thameslink Study 'Do Max' - Pre-COVID | TfL Metroisation |
|---|---|---|---|---|
| 'Sussex Metro' | Hackbridge Line - Victoria | 4 | 6 | 4 |
| | Norbury Line | 10 | 12 | 12 |
| | Gipsy Hill | 6 | 8 | 10 |
| | West Croydon - Wallington (Incl Fasts) | 8 | 12 | 14 |
| | West London Line | 7 | 11 | 12 |
| | Balham - Clapham Jn | 16 | 20 | 22 |
| | **Sussex Metro - Victoria** | **14** | **16** | **18** |
| | Sydenham Corridor - London Bridge | 6 | 6 | 6 |
| | Tulse Hill - London Bridge | 6 | 6 | 8 |
| 'Kent Metro' | Greenwich Line - London Bridge | 6 | 8 | 8 |
| | Charlton – Blackheath Line | 3 | 2 | 2 |
| | Barnehurst Line | 11 | 10 | 12 |
| | Sidcup Line | 8 | 12 | 12 |
| | Grove Park Line | 7 | 8 | 8 |
| | Hayes Line | 6 | 6 | 6 |
| | Lewisham - London Bridge | 20 | 20 | 24 |
| | Hither Green - Lewisham | 6 | 10 | 13 |
| | Lewisham Avoiders - London Bridge (via New Cross) | 12 | 14 | 10 |
| | **Kent Metro - London Bridge** | **36** | **40** | **40** |
| | Lewisham - Victoria | 3 | 4 | 6 |
| | Bromley South - Victoria | 4 | 6 | 6 |
| | **Kent Metro - Victoria** | **7** | **10** | **12** |
| Thameslink via Elephant & Castle | Wimbledon Loop - BFR | 4 | 8 | 8 |
| | Catford Loop | 4 | 6 | 6 |
| *Less than Dec-19* | *Greater than Dec-19, but below Metroisation* | | *Same as Metroisation* | |

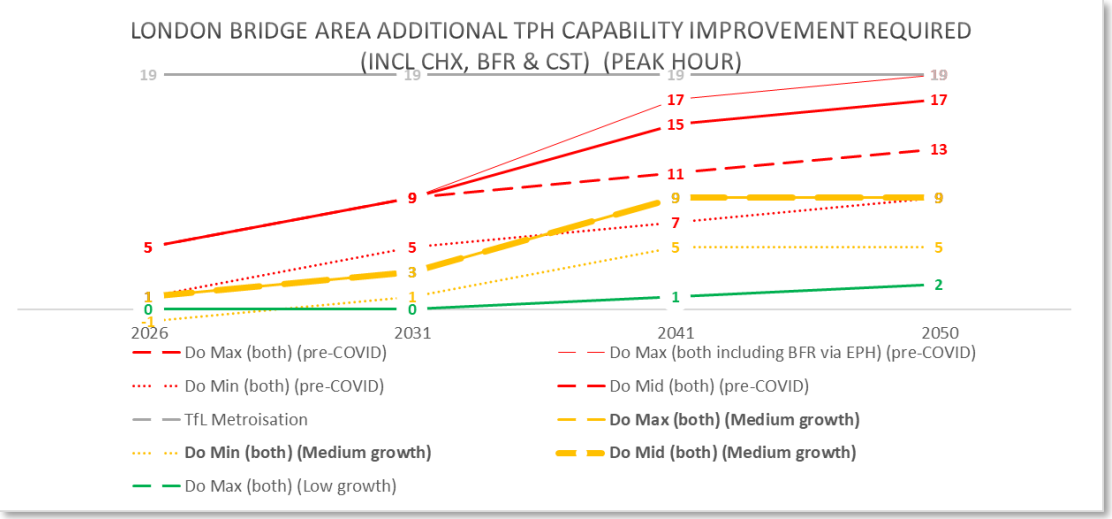



*Figure 46: Graph showing new capacity requirement at London Bridge under different ITSS and post-COVID scenarios demonstrating the pathway from the current infrastructure and service (bottom left), to a possible end state of TfL 's Metroisation concept (top right). TfL Metroisation frequencies overlaid with the South London & Thameslink 'Do Max' Mainline uplift and standard timetable planning assumptions to provide comparison to other ITSS scenarios identified in this study.*

# The Strategy: Interfaces & Projects

## Stations

*Table 40: Station priority list for decongestion in South London*

| Priority stations in South London for decongestion | | |
|---|---|---|
| Station | Priority | Status for improvement |
| London Victoria | 1 | In development (in RNEP pipeline) |
| Clapham Junction | 1 | In development (in RNEP pipeline) |
| Peckham Rye | 1 | In development (in RNEP pipeline) |
| Lewisham | 1 | In development (in RNEP pipeline) |
| Wimbledon | 1 | Early stages of development |
| Battersea Park | 1 | Advanced stages of development |
| Brixton | 1 | Early stages of development |
| Bromley South | 1 | Early stages of development |
| Brockley | 2 | Early stages of development |
| West Brompton | 3 | Advanced stages of development |
| London Cannon St | 3 | Identified as a problem |
| Elephant & Castle | 3 | Early stages of development |
| Queens Rd Peckham | 3 | Identified as a problem |
| Tulse Hill | 3 | Identified as a problem |
| Balham | 3 | Early stages of development |

Almost all priority 1, 2 and 3 stations in the study area are already in some form of development. Some are already in the RNEP pipeline, and so are developing business cases and refining options for managing crowding and improving passenger experience. For many of these in development there are short and long term options.

Others, such as Brixton and Elephant & Castle are linked to 'Business Development' activities, which are being supported by third parties who are interested in improving the station and surrounding area. For example, at Elephant & Castle, a new shopping centre is being constructed which is supporting improvements to the crowded, non-step-free station.

Brixton, Bromley South and Balham are part of Network Rail's early feasibility process, with initial strategic advice and preparation for Strategic Outline Business Case development. These are priorities for further development.


**Denmark Hill Upgrade:** In September 2021, a new entrance opened at Denmark Hill. Prior to this the station was a Priority 1 station for crowding. One-way systems had to be installed, train dwell performance was poor, passenger feedback was negative, and the station was disconnected to the neighbouring hospitals (Maudsley and Kings College)

As a result, platforms have been decluttered, canopies have been extended, and a new entrance has opened opposite the new Maudsley Hospital entrance. Art installations reflect Camberwell's identity, and new photovoltaic 'film' makes the station the first 'Carbon positive' station in the UK.


## Accessibility

*Table 41: Stations in South London with accessibility enhancement in development*

| Stations where accessibility upgrades are currently being pursued | | |
|---|---|---|
| **Station** | **Funding Source** | **Status for improvement** |
| Peckham Rye | AfA 2019 list | In development as part of a decongestion upgrade |
| Catford | AfA 2019 list | In development |
| Hither Green | AfA 2019 list | In development |
| Petts Wood | AfA 2019 list | In development |
| St Mary Cray | AfA 2019 list | In development |
| Streatham | AfA 2019 list | In development |
| Battersea Park | AfA 2019 list | In development as part of a decongestion upgrade |

Delivery of improvements to accessibility over the last few Control Periods (5-year periods for which Network Rail's budget is agreed) has mostly been funded through the rolling Government 'Access for All' programme, and from local contributions including Local Authority funds and Developer contributions. At time of writing, there are currently 7 accessibility upgrades in planning or delivery across the study area (See table above).

# The Strategy: Interfaces & Projects

## Case Study 1: Peckham Rye Station Upgrade

The drivers for upgrading Peckham Rye station include:

1. **Accessibility:** It is the busiest interchange station in the UK with no step free access to platforms and no lifts.
2. **Overcrowding:** It is a Priority 1 station for overcrowding, which occurs at the gatelines, the narrow stairs to the platforms, and on the narrow platforms.
3. **Passenger Experience:** Because of the poor access and crowding, and the general run down condition of the station, passenger's experience of the station is poor.
4. **Safety:** The limited number of gatelines, narrow stairs and especially the platforms are a risk to safety. Crowding and poor passenger experience can cause friction and stress.
5. **Performance:** Improved distribution of passengers along platforms will help to improve train dwell performance by allowing quicker boarding and alighting.
6. **Public Realm Upgrade:** Redevelopment will support wider improvements including the creation of a new central square for Peckham and improved night time economy.

**Upgrade options:** Work to create the new central square, improve the night-time economy and restore the station façade is already secured by LB Southwark. Regarding the station itself, there are 2 options: A '**Partial**' option which includes a new rear atrium, housing a new gateline, new staircases and lift access to platforms, and platform decluttering. A '**Full**' option would build a new platform to turn the current island platform into a single-face platform, extended platform canopies and platform widening. The station would house local businesses and local art to represent Peckham.

**Progress:** Network Rail are planning to deliver this project via GTR and working closely with LB Southwark and local community groups, including Peckham Vision.

The project is **preparing to develop a Final Business Case**, and subject to planning, funding, and securing vacant possession of land, is planning to deliver by the end of 2024.

## Case Study 2: Lewisham Station Upgrade

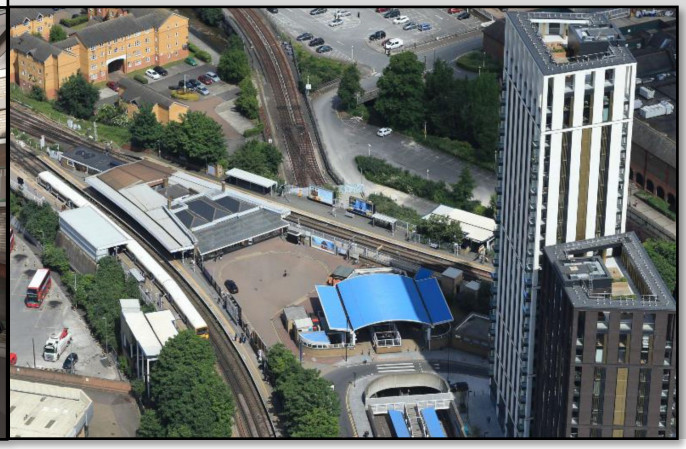
The drivers for upgrading Lewisham station are very similar to Peckham Rye and include:

1. **Overcrowding:** It is a Priority 1 station for overcrowding, which occurs at the gatelines, the narrow subways and stairs, and narrow platforms. Interchange with the Docklands Light Railway (DLR) also causes significant congestion.
2. **Passenger Experience:** Passengers are frustrated by the congestion and current one-way system.
3. **Safety:** The limited number of gatelines, narrow stairs and platforms are a risk to safety, as is the stepping distance between the train and curved platforms.
4. **Performance:** Reduced crowding of the station will allow for improved passenger flow and distribution. This will help improve train dwell performance.
5. **Growth:** Usage of Lewisham station will increase: The area is seeing significant housing growth; rolling stock lengthening and increased frequencies are planned for the DLR for 2024; and Phase 1 of the Bakerloo Line Extension is planned to terminate at Lewisham. Because of this, it is expected crowding will quickly return at Lewisham post-COVID.

**Upgrade options:** Track alignment work is already being enhanced to improve the stepping distance between the train and platform. In the short-term, options to improve safety, passenger experience, crowding and performance include moving the gatelines off platform 1, improving wayfinding across the station, and improving the platform canopy provision. The longer term options include widening platforms, new subways/footbridges, and improved interchange with the DLR and the Bakerloo Line (if extended).

**Progress:** Network Rail are developing this project via Southeastern and working closely with LB Lewisham, Transport for London and the Department for Transport.

The project has not yet identified a preferred option for the station. **Delivery is currently unfunded**.



# 6

# The Strategy
# External Proposal Review

- Brockley High Level
- Enhanced Service to Belmont
- Clapham High Street to Victoria services
- Camberwell new station
- Connectivity to Ebbsfleet

# The Strategy: External Proposal Review

## Brockley High Level

Brockley is a station on the approaches to London Bridge served by frequent London Overground and Southern Metro services into the City and East London. It is suggested that whilst connections to central London are good, it is challenging to travel between south and South East London. Travelling from Lewisham to Croydon by rail, for example, relies on passengers going into central London and then back out.

London Borough of Lewisham and TfL have identified Brockley as an ideal site for an interchange as Lewisham—London Victoria services pass over the current Brockley station. By building platforms, lifts, and stairs between these platforms, passengers could interchange between orbital and radial rail services, potentially reducing pressure on central London stations and services.

A new station stop would add journey time to existing travellers, and potentially be challenging to integrate into the timetable, and potentially impact performance and freight services, as it sits between two bottlenecks: Lewisham and the South London Line.

However, new connections could improve journey times for others by offering new routes to destinations. Network Rail has conducted a high-level review into the connectivity benefits and disbenefits such a proposal could provide. This suggests the proposal has **significant potential for strategic merit**, with user benefits from improved journey times and revenue benefits to the network.

It is proposed Network Rail work with LB Lewisham and TfL to identify opportunities to develop proposals for the station and further explore its potential economic and operational impacts.

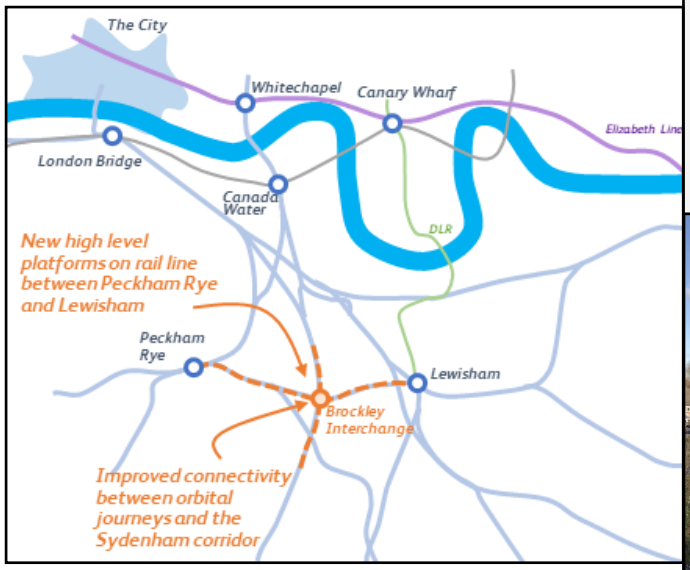



*Figure 47: Diagram showing location of a possible Brockley Interchange station*

## Enhanced Service to Belmont

The London Cancer Hub is a sizeable development identified for the former Sutton Hospital site in Belmont. It will form an emerging life science district where the Royal Marsden NHS Foundation Trust and the Institute of Cancer Research currently operate. The London Cancer Hub will deliver multi-use site pioneering Cancer research and treatment, potentially uplifting the number of jobs on site by a further c.7,000. LB Sutton have made the case for investment in sustainable transport connectivity to ensure that new jobs and services on the site can be readily accessed without reliance on cars.

To support the Cancer Hub's development, LB Sutton propose that the current service to Belmont station is uplifted from today's 2tph to 4 or 6tph in the medium to long-term. To deliver this uplift, the branch will likely require enhancement, such as new turnback facilities and potentially double tracking.

4tph could potentially be delivered by extending current (Dec-19) services from Sutton, but a 6tph all-day service would require an additional 2 new services to operate during the off-peak through to London.

LB Sutton commissioned an early business case review of the proposal, which has identified at this early stage that it likely has a strong strategic case and good economic case. It is advised that more detailed economic and operational analysis is undertaken to fully understand the costs and benefits, and any other potential enhancements that could be delivered on the Epsom Downs branch.

Should the LB Sutton be successful in securing development funds from an application to the HM Treasury's 'Levelling Up Fund', Network Rail should support the development of the proposal through the industry development process.

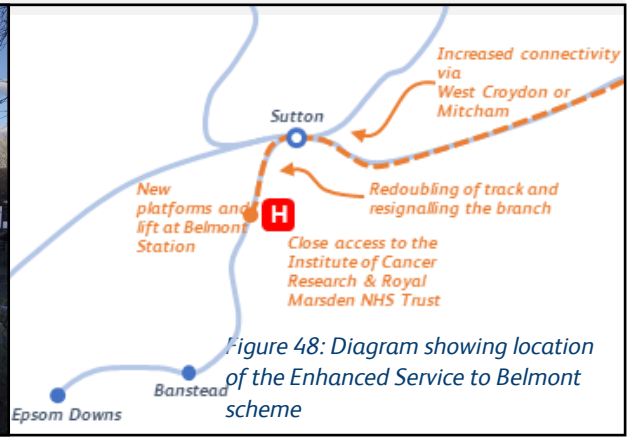



*Figure 48: Diagram showing location of the Enhanced Service to Belmont scheme*

# The Strategy: External Proposal Review

## Clapham High Street to Victoria Services

**Overview**

Located within walking distance of the Northern Line, and a recognised 'Out of Station Interchange' with the Underground, Clapham High Street is an existing station located in central Clapham, served by London Overground services between Clapham Junction and Dalston Junction. Residents have suggested increasing investment in the station's utility as an interchange. They suggest accessibility and better wayfinding could reduce pressure on the overcrowded Northern Line. They also call for a new service to Victoria, which is the focus of this page. The station is due to benefit in the medium-term from a service uplift planned by TfL, increasing Overground frequencies from 4tph to 6tph.

Two key service options exist to improve service connectivity to and from Clapham High Street.

1. Call Lewisham—Victoria stopping services at the current platforms, providing up to 4tph following potential future enhanced frequencies.
2. Call Bromley South—Victoria stopping services at either new platforms on the 'fast lines', or by crossing over to the current platforms, providing 4tph.

As Underground services are so frequent, modelling suggests that with 4tph between Clapham High Street and Victoria, the general attractiveness of this route will not increase due to the wait time combined with the journey time. Therefore, whilst it may be used by passengers crowded off the Northern Line, it is unlikely to cause a noticeable reduction in Northern Line crowding.

One point of key strategic merit is that improving the accessibility of Clapham High Street could provide more accessible journey opportunities due to a new service linking to the fully accessible Victoria station.

**Option 1 (Lewisham—Victoria services)**

The first option, calling Lewisham—Victoria services at the existing platforms, **is recommended**. There is low risk of negatively impacting Mainline services with this option. Additionally, because Southeastern services currently operate between Overground services, a station call presents a low risk to current or future Overground frequencies. This option likely presents low risk to Northern Line crowding, as passengers east of Clapham High Street have alternative options for accessing central London, such as via Blackfriars.

Economic analysis suggests Option 1 has marginal net positive benefits, but likely not enough to cover the cost of extending the 5-car platforms to 8-car. As such, calls at Clapham High Street will have to coincide with the introduction of new rolling stock with selective door opening capability. As discussed on page 67, this would have to be demonstrated as a low risk option. Otherwise, third party funding may need to be sought for platform extensions.

**Option 2 (Bromley South—Victoria services)**

This study **does not recommend Option 2.** It is recognised that this option does bring some connectivity benefits, such as between the Chatham Mainline and Clapham Junction. However, due to the interaction of services through this area (see page 53), any increase in Metro journey time by calling at new platforms knocks onto the following Mainline services, unless calls were removed from preceding stations. Economic analysis suggests this disbenefit vastly outweighs any potential benefit, thereby ruling out the possibility of stopping this service and constructing new platforms.

Secondly, using the existing 5-car platforms would involve increased line crossings and train conflicts on the busy Victoria approach. Again, this would result in significant performance and timetable flexibility risks.

Calling the Bromley South Metro services at Clapham High Street could also potentially worsen Northern Line crowding, as more passengers decide instead to interchange at Clapham High Street as opposed to Brixton or Victoria.

# The Strategy: External Proposal Review

## Camberwell New Station

**Overview**

Camberwell is a community located within Southwark which has campaigned for improved public transport connectivity. The campaign suggests that existing transport (predominantly bus) offers the area relatively poor journey times and a lack of status afforded to similarly located areas such as Brixton or Peckham.

The area is bisected by the Thameslink route south of Elephant & Castle. In theory, the restoration of Camberwell station, which closed to passengers in 1916, could potentially provide a service of at least 4tph to London Blackfriars.

TfL previously produced an Strategic Outline Business Case for the station proposal, which concluded that despite the station having a good strategic case for investment it would likely provide Poor Value for Money, primarily due to the disbenefits to existing passengers of longer journey times outweighing the possible benefits. It is recognised that with the increased frequencies proposed in the South London & Thameslink Service Improvement Study along the artery, there could be opportunity to revisit the economic case.

**Dec-19 services? - Not ideal**

Economically, any change in journey time to the Dec-19 services disbenefits almost all the passengers onboard travelling to/from central London via this route, which has always outweighed the station's benefits.

Operationally, 8 out of the 10 Metro services through the area travel through the Thameslink Core which is an inflexible and constrained timetabling bottleneck. Whilst there may be some opportunity to incorporate calls into modified Catford Loop service timetables due to longer turnarounds at Sevenoaks / Orpington, the current Wimbledon Loop services have minimal opportunity.

With the Wimbledon Loop timetable bound by the Thameslink Core, Wimbledon single platform, numerous flat junctions (i.e Herne Hill), and the fact it being a loop meaning there is no turnaround time to absorb net additional calls, current Wimbledon Loop services do not present an ideal option for Camberwell.

Additionally, the 2tph Beckenham Junction—Blackfriars services are currently peak only, not presenting a long-term solution for Camberwell.

Finally, services via the Camberwell site suffered from significant crowding pre-COVID. Without extra capacity, passengers may not be able to board services in the peak from a new station at Camberwell.

**Future services? - More opportunity**

There is likely a requirement for an additional 4tph from the Wimbledon Loop to Blackfriars to meet high and medium growth forecasts (see page 54). The turnaround time at Blackfriars for these new services presents an ideal opportunity to absorb an additional station call, subject to the turnaround length. This service is only required for the future peak, and could be ramped up in phases in 2020s and 2040s. Being an all day service would bring more benefits to more communities than just Camberwell.

As a new service, the impact to 'current' passengers is likely to be less, particularly if the Dec-19 service is maintained at Loughborough Junction station (4tph), but new services call instead at Camberwell, therefore not increasing journey times. Economic analysis conducted on this option suggests that the economic disbenefits previously predicted could decrease sufficiently to **allow the project to return net benefits,** but not necessarily all the way to offsetting the costs. This means value for money may still be challenged without third party funding. Depending on service routing, there is the opportunity for a new station to have only 2 platforms as opposed to 4 which could help to reduce the cost burden.

Finally, an additional 2 services are likely required to operate between Peckham Rye and Blackfriars in the future peak to accommodate crowding (ideally from late 2020s). These would also terminate at Blackfriars, and therefore could accommodate a call at Camberwell. This service would likely benefit from having 4 Camberwell platforms due to routing flexibility, increasing costs. Due to freight interactions, it is likely that this service will be peak only, so would not present the optimum solution for Camberwell.

**Next steps**

The economics of providing a new station at Camberwell is likely to remain challenging, but the proposal should not be disregarded. It is proposed that as part of developing plans for higher frequency Wimbledon Loop services, the option of a new station at Camberwell is considered as an additional sensitivity with revised infrastructure costs calculated. There is also a key dependency with identifying options for additional reliable all-day services into Blackfriars.

*Table 42: Comparison of service options for Camberwell, colour coded to indicate likely feasibility. Green—Low risk, Yellow—Medium risk, Red—High risk*

| Origin | Destination | Possible 2040 Frequency | Current or future service? | Possible to call at Camberwell? | Confined to slow lines? |
|---|---|---|---|---|---|
| **Wimbledon Loop** | Thameslink | 4tph | ***Dec-19 service*** | High risk – timetable recast | No |
| **Catford Loop** | Thameslink | 4tph | ***Dec-19 service*** | Medium risk – timetable recast | No |
| **Beckenham Junction** | Blackfriars | 2tph (peak only) | ***Dec-19 service*** | Medium risk – timetable recast | Yes |
| **Peckham Rye** | Blackfriars | 2tph (likely peak only) | ***Possible new service*** (from 2020s) | Yes, replacing pathing time | No |
| **Wimbledon Loop** | Blackfriars | 4tph (peak only or all day depending on performance) | ***Possible new service*** (2tph 2020s, 4tph 2040s) | Yes | Yes |

# The Strategy: External Proposal Review

## Connectivity to Ebbsfleet

The Elizabeth Line's (Crossrail) South Eastern terminus is currently Abbey Wood, providing interchange with Southeastern and Thameslink services onwards to Dartford and Medway. Thames Gateway Kent Partnership (TGKP) have identified the Abbey Wood to Ebbsfleet corridor as a growth opportunity, and that enhanced transport connectivity will be key to enabling housing and employment growth in the area. Elizabeth Line services would be extended from Abbey Wood through to Ebbsfleet either on dedicated or shared infrastructure. This would provide new connectivity between HS1, Heathrow Airport and Canary Wharf.

The C2E Partnership, led by LB Bexley and including the affected Local Authorities, GLA and Ebbsfleet Development Corporation, have submitted an Strategic Outline Business Case (SOBC) to Government outlining the range of options for improving connectivity to Ebbsfleet. The preferred option identified in the SOBC is for 8 of the 12 Elizabeth Line services per hour to extended to Gravesend, sharing existing tracks with Southesatern and Thameslink. This requires some changes to Southeastern services to reduce operational conflicts and accommodate Elizabeth line services beyond Dartford. This option also requires construction of some sections of additional track and junction works within the existing rail corridor, significant works at Abbey Wood, Slade Green and Dartford stations and requires additional land to accommodate additional train stabling facilities.

Map source: Abbey Wood to Ebbsfleet Connectivity Strategic Case, Page 52

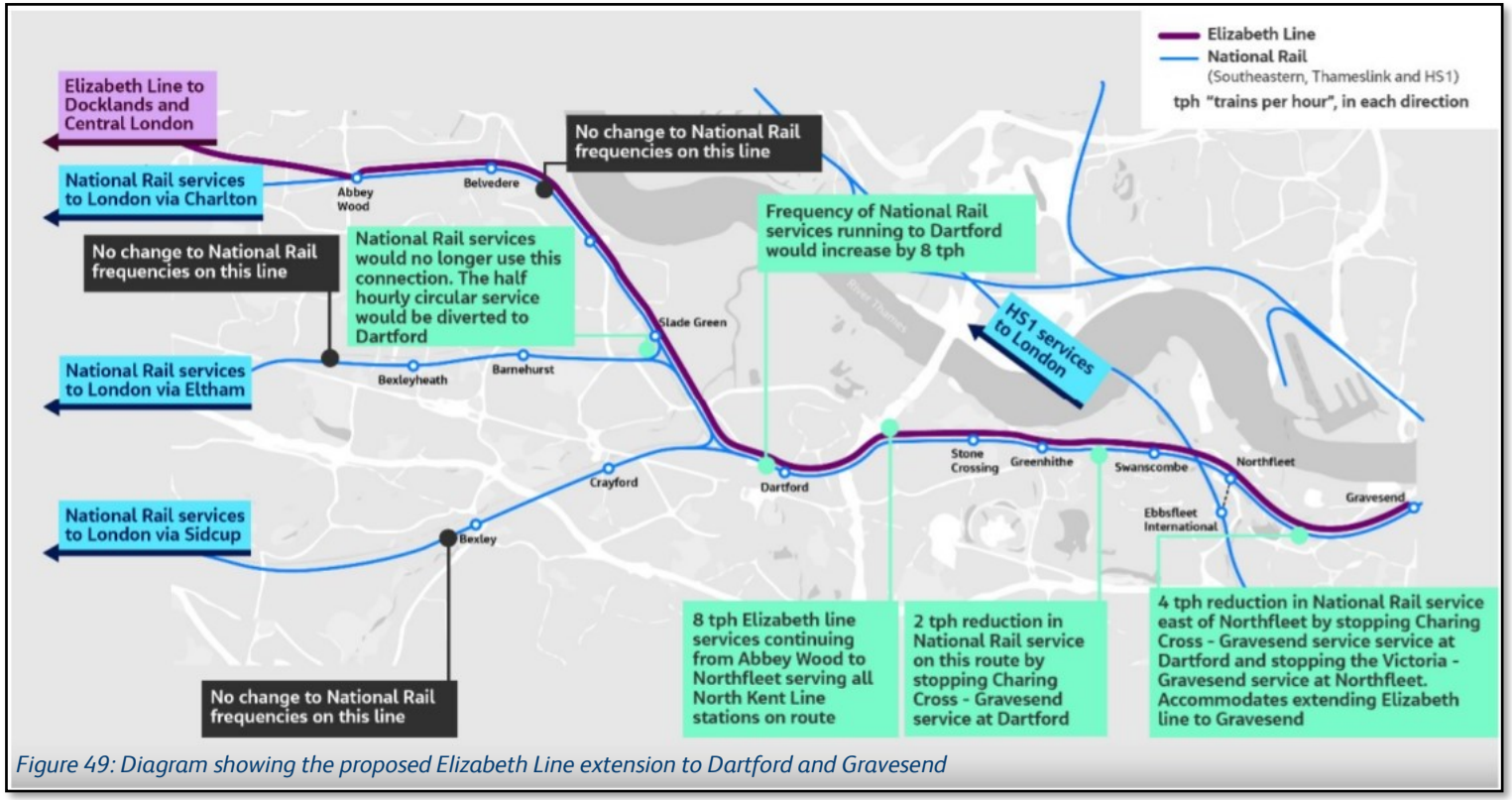



*Figure 49: Diagram showing the proposed Elizabeth Line extension to Dartford and Gravesend*

Network Rail has supported The C2E Partnership with the development of the SOBC, commissioning a timetable study that reviewed opportunities for additional services to Abbey Wood, as well as an infrastructure feasibility study to identify how additional services could be supported.

Network Rail continues to work closely with The C2E Partnership following the submission of the SOBC.

# 7

# The Strategy
# Long Term Interactions

- Post-COVID demand
- The Elizabeth Line
- Crossrail 2
- Bakerloo Line Extension
- High Speed 2
- London Resort Theme Park

# The Strategy: Long Term Interactions

## Post-COVID demand

**What has the trend been?**

Compared to May 2019, May 2020 saw 93% fewer rail travellers using London terminals. However, when restrictions were partly eased, rail usage bounced back. In May 2022, rail usage was only down around 25% compared to May 2019 suggesting a relatively quick recovery to the low growth scenario used in this study. (See page 14 for graph)

**Example impact on the network**

**How could market share change?** The 'Rail COVID Forecasting Group' (RCFG) has been exploring the possible future impacts that COVID could have on rail demand. They identified that the number of people moving away from London was accelerated during COVID, and so there is a potential shift of people moving away from Metro services to Mainline services. However, this does not necessarily mean Mainline services will be comparatively more popular. It is possible that those moving further away may work from home more, whereas those closer to the office may choose to commute more often. As the post-pandemic recovery continues, this trend may slow or reverse and therefore the ratio of Metro and Mainline **services in the future will need to be reactive and flexible** to make best use of available infrastructure and deliver for the recovering markets.

For leisure passengers, the outlook post pandemic is to travel as often, if not more, than what they used to pre pandemic (RCFG). This compares to commuter passengers who plan to travel less frequently. For a typical 2021 weekday, the RCFG predicted that peak travel would be down 35% compared to 2019, but off-peak travel down only 20%. This trend turned out to be true with weekends generally closer to pre-COVID passenger numbers than weekdays.

Finally, TfL report that whilst the orbital Overground routes were hit by the pandemic, they have bounced back more quickly than other rail services due to catering for a more resilient market.

**Is there need for peak capacity?** Whilst commuter travel may be down in the short term, crowding is still forecast to be a medium to long-term issue, requiring frequencies higher than operating in 2019. Increased off-peak travel may also require higher off-peak frequencies, which, combined with off-peak freight services, would benefit from enhanced infrastructure traditionally designed for high frequency peak services.

## The Elizabeth Line

**What is it?**

Crossrail, or the Elizabeth Line, is a railway project, which commenced initial services in May 2022 and aims to provide a high frequency suburban passenger service crossing London from east to west. A key section of the line is a branch that runs from Whitechapel in east London towards Canary Wharf and across the Thames to connect with the North Kent Line at Abbey Wood in South East London.

**Example impact on the network**

Analysis looked at what impact The Elizabeth Line would have on the Sidcup, Bexleyheath and Dartford Lines, for passengers travelling to Canary Wharf and Farringdon.

**Sidcup & Bexleyheath Line:** Due to the long journey time between Sidcup/ Bexleyheath and Abbey Wood, absolute journey times remained faster via London Bridge (& Jubilee Line), or Lewisham (& DLR). Generalised journey times (which includes the interval between services) also remained more competitive via London Bridge or Lewisham due to the higher frequency services, both on Southeastern and TfL services, compared to the 2tph between Sidcup and Abbey Wood. If 4tph were provided between Sidcup and Abbey Wood, journeys would still not be quicker via The Elizabeth Line, but may be just competitive for stations further east such as Bexley.

**Dartford Line:** Both 'absolute' and 'generalised' journey times from Dartford will be quicker via The Elizabeth Line to Canary Wharf and Farringdon. This is due to frequent, quick journeys to Abbey Wood, and then faster journeys onwards into London than via London Bridge.

**Summary:** It is unlikely that The Elizabeth Line will see a significant change in flows from the Sidcup and Bexleyheath lines, although it is more likely that passengers from the Dartford Line will change at Abbey Wood onto Elizabeth Line services. This could result in slight crowding relief on the London Bridge services. This analysis does not suggest it should be a priority to increase frequencies from the Sidcup and Bexleyheath Line to Abbey Wood, as most journeys will remain more attractive via the London Bridge or Lewisham.

The industry will continue to monitor demand as travel patterns stabilise.

# The Strategy: Long Term Interactions

## Crossrail 2

**What is it?**

Crossrail 2 is a new proposed rail project, linking Hertfordshire and Surrey, providing a new north-south link across London. The project would join the South Western Mainline in the south to the West Anglia Mainline in the north, via London Victoria and Kings Cross St Pancras.

**Example impact on the network**

**To Euston:** From origins such as Gatwick Airport, Sutton and East Croydon, journeys to Euston will be fastest by changing onto Crossrail 2 at Clapham Junction, thereby avoiding Victoria, but cementing the Clapham Junction route as the fastest route to Euston. This is due to Crossrail 2 being quicker between Clapham Junction and Victoria, and also being quicker between Victoria and Euston compared to the Victoria Line. This could help to shift some of the passenger growth away from London Bridge flows to the Victoria flows.

**To Dalston:** Crossrail 2 will also serve Dalston, and so analysis also looked at journeys from Denmark Hill and Crystal Palace. It showed that the generalised journey time via Crossrail 2 is almost as fast as the generalised journey time via Canada Water (modelled with TfL Overground frequencies of 4tph on each route). Enhanced TfL Overground frequencies would help to further increase the competitiveness of the East London Line services.

**Wimbledon Loop:** As Crossrail 2 would call at Wimbledon, and deliver new, fast and direct connectivity to St Pancras and Angel, it is possible the Wimbledon Loop Thameslink services via Herne Hill may be slightly relieved of crowding. Should this be the case, it may mean Wimbledon Loop frequencies to Blackfriars only need to increase by 2tph (with 2tph remaining to London Bridge via Tulse Hill from the Wimbledon Loop). This may mean Kent Mainline services could remain in the Blackfriars Bay platforms. However, this could also impact the case for reinstating Camberwell station if frequencies only increase by +2tph from the Wimbledon Loop, and not +4tph. It is also likely the route between Sutton and Wimbledon could increase in popularity for interchange with Crossrail 2.

**Summary:** Whilst Crossrail 2 will provide a significant 10% boost in rail capacity into central London, it will not necessarily have a direct impact on how journeys are taken on the Sussex Metro network. The key change is that interchange will likely increase at Clapham Junction, and Mainline flows could grow on the Victoria routes, but generally, the current fastest routes for passengers in south central, and South East London, will remain generally on the current network.

## Bakerloo Line Extension

**What is it?**

The Bakerloo Line Extension (BLE) is a proposal by TfL to extend the Bakerloo Line from Elephant & Castle to Lewisham (Phase 1) and to Hayes (Phase 2), enhancing the current Network Rail infrastructure between Lewisham and Hayes. TfL propose that the Bakerloo Line to Hayes would see 18-24tph operating to New Beckenham, where the line splits. 12-18tph would continue to Hayes and the remainder would terminate at Beckenham Junction (TfL).

**Example impact on the network**

**Lewisham:** Lewisham would gain additional connectivity to Waterloo and Charing Cross, as well as new connectivity to Oxford Circus and Paddington. Journey times to these destinations, including Charing Cross, would be quicker with BLE. Lewisham will therefore become a key strategic interchange for South East London. Direct connectivity to London Bridge, Cannon Street and the City of London would be lost from the Hayes Line.

**Hayes Line:** As only 6tph operate from Hayes in the peak Dec-19 timetable, the generalised journey times post BLE will vastly improve due to planned frequencies of 12-18tph. TfL also predict journey times from Hayes to Lewisham will be 6 minutes quicker than in 2019. As there is the loss of the London Bridge services from Hayes, absolute journey times from Hayes to London Bridge could be 3 minutes longer than in 2019, but considering the much higher frequencies times, this could be offset. For travel to the West End, Hayes Line passengers would likely remain on the Bakerloo Line, reducing crowding on Charing Cross services.

**Beckenham Junction Interchange:** Analysis explored whether passengers would use Beckenham Junction as a strategic regional interchange for access to central London (i.e Oxford Circus), instead of travelling via Victoria. It found that as journey times to Victoria on Southeastern services are so quick, interchanging onto the Bakerloo Line at Beckenham Junction would result in a generalised journey time of around 5-9 minutes longer, although an additional 2 Metro services per hour calling at Beckenham Junction would make the interchange more competitive.

**New Cross Gate Platform 6:** Finally, there is opportunity to consider New Cross Gate as a strategic interchange with Sydenham Corridor 'Mainline' services. This could provide a preferred interchange over London Bridge, and offer quicker connectivity from Sussex services to Lewisham and further interchange opportunities. A new platform would be required at New Cross Gate to permit this to happen. This would likely require non-Network Rail land, the potential rebuild of the New Cross Road bridge, or removal of the fast line platforms 3&4 to allow for a more efficient track alignment. This additional land is likely required initially for Bakerloo Line Extension construction and therefore a new platform has a dependency on the progression of the Bakerloo Line extension.

# The Strategy: Long Term Interactions

## High Speed 2

**What is it?**

HS2 is a new High-speed railway being built that will provide direct, fast services from London to Birmingham (Phase 1), Crewe and major cities in the North-West of England (Phase 2a) and direct services to parts of the Midlands and the North (Phase 2b). There will be 2 stations in London for interchange including London Euston and Old Oak Common.

Hythe Road and Old Oak Common Road are two new London Overground stations that have been proposed to provide an interchange between London Overground services and HS2 in the Old Oak Common area. Hythe Road station would be on the West London Line.

**Example impact on the network**

**Sussex:** Should Hythe Road be constructed, then journeys from the Sussex Metro area, including Sutton and East Croydon, would be fastest via Clapham Junction and the West London Line to interchange with HS2. Although, when considering generalised journey times, interchange through Victoria and Euston could be marginally more competitive. Increased frequencies on the West London Line, reducing wait times, would shift this dynamic.

**Kent:** From the Kent network, as no services call at Clapham Junction, and due to frequent Victoria Line or Northern Line connections from Victoria or London Bridge station, it is likely that the preferred method of access to HS2 will be via Euston. The one exception is for journeys from the Dartford area, where interchange onto The Elizabeth Line at Abbey Wood would offer competitive journey times to Old Oak Common.

**Without Hythe Road:** Without the development of Hythe Road, the nearest London Overground station to Old Oak Common station would be Willesden Junction—around 1.5km away. This will not likely offer a convenient method for passengers wanting to access the HS2 network. A lack of suitable overground connection between the South London network and Old Oak Common, will contribute to more passengers from South London accessing HS2 via Euston.

**West London Line Crowding:** Increased passenger numbers on the West London Line would increase crowding, but the ITSSs proposed earlier in this document result in pre-COVID peak standing densities for 2050 of below 3 passengers per square metre. This should mean there is sufficient capacity to accommodate HS2 interchange passengers.

## London Resort Theme Park

**What is it?**

London Resort Theme Park is a proposed theme park and resort complex in Swanscombe, near Ebbsfleet international (HS1), Swanscombe and Greenhithe railway stations (North Kent line).

**Example impact on the network**

Data provided to Network Rail suggests that the majority of passengers will be travelling during off-peak periods and using HS1 services to and from London St Pancras. There is likely to still be an impact on South East Metro services and a number of improvements are expected to be required over the coming years to help accommodate this increased level of demand and provide the best experience for passengers. These include:

- Enhancements to Swanscombe station to provide a second entrance to link to the park.
- Lengthening of Metro services via Swanscombe to maximum lengths by 2029.
- Stopping of Southeastern Victoria fast services at Swanscombe station to bring service frequency up from 4pth to 6tph.
- More consistent, and similar level of service 7 days a week to and from the theme park, particularly over the weekend.
- Longer dwell times will likely be required at Swanscombe station, which could be similar to Gatwick Airport e.g. around 3 minutes. These will need to be time bound for specific periods of the day for efficiency.
- Possible improvements at key interchange stations including Hither Green, Lewisham and Abbey Wood to cope with increased demand.
- Minor spacing changes to improve service frequency intervals.
- If additional services are required above the current forecasted, consideration will also need to be given to impact on rolling stock, depots and stabling and power supply.

# 8

# The Strategy Next Steps

# The Strategy: Next Steps

## Recommendations

**Please note: Funding for enhancements is significantly constrained due to the COVID pandemic.**

**All recommendations are subject to future demand projections**

**Primary**

**Services:**

- **R1: Reactive service recovery post-COVID:** Post-COVID recovery should be monitored closely with service reinstatements and enhancements proportionate and reflective of the level of recovery. Future development requires a stable baseline which reflects future travel patterns. This will also allow for more efficient use of current infrastructure and allows for more time to develop suitable infrastructure enhancements.
- **R2: Wimbledon Loop Even Interval 4tph:** Development of more detailed service and performance options to identify optimum method of providing a capacity and connectivity step change on the Wimbledon Loop. This should include performance and economic analysis, and detailed consideration of freight interactions.
- **R3: Clapham High Street Connectivity:** A Clapham High Street call should be added to Lewisham-Victoria services following introduction of new rolling stock and subject to safety assessment of selective door opening.
- **R4: Later departing services from central London:** Opportunities to reduce the disparity of last departures to south London should be further developed, considering its economics and interfaces with railway maintenance requirements.
- **R5: Improved off-peak & Sunday frequencies:** Opportunities for enhanced off-peak frequencies should be further developed through economic analysis as well as considering the interface with capacity, operations and freight.

**Modelling:**

- **R6: 2050 Timetable**: Using requirements and specific timetable analysis from this study, develop a 2050 timetable, viewing South London as one. Develop a clearer picture of infrastructure requirements further in the future. Support a whole picture economic model and other factors such as power supply.
- **R7: Power Modelling:** Launch a power modelling study to establish future power requirements in light of rolling stock upgrades/lengthening, and an increase passenger and freight services.

**Infrastructure Development & Rolling Stock:**

- **R8: Croydon Area Bottleneck Relief:** Sussex Mainline crowding is likely to return by the late 2030s even under low post-COVID recovery. Therefore, relieving the 'Croydon Bottleneck' allowing service frequency increases and improving performance remains a long term aim. This will benefit both Metro and Mainline passengers and incorporate enhancements including, timetable changes, grade separation, new turnback facilities, improved stabling, and enhanced stations.
- **R9: Victoria Capability Improvement:** Victoria represents a good opportunity to provide additional terminal capacity for the South East, potentially helping to relieve other congested terminals. Therefore, development work should continue to identify future layout and service options to improve performance, increase capacity and enhance connectivity in line with planned renewals.
- **R10: Clapham Junction Capability Improvement:** Clapham Junction presents a significant constraint for enhancing Metro and Mainline frequencies. Therefore, development work should continue on identifying future layout and service options to allow for improved performance, increased capacity and enhanced connectivity.
- **R11: New Rolling Stock:** Replacement of Metro rolling stock with Class 700 style 4-car and 6-car units. This would reduce short term crowding pressure, improve passenger experience, and provide the flexibility to operate multiple train lengths. This would also allow for other rolling stock cascades, providing benefit to the wider network.
- **R12: South London Line Enhanced Flexibility:** Identifying infrastructure opportunities to improve performance and flexibility on the South London Line (Peckham Rye—Clapham Junction), and to operate more services during engineering works. Likely to consider new turnbacks, additional crossover and line speed enhancements.
- **R13: Station Capacity Relief Business Cases:** Develop enhancements to reduce capacity issues at priority stations, including specifically Peckham Rye, Clapham Junction, Lewisham, Bromley South, Brixton and Balham.
- **R14: London Bridge Area Capability:** Further explore opportunities to provide long term capability improvements for critical Kent and Sussex networks. Focus could include further development of proposals for Blackfriars expansion.

# The Strategy: Next Steps

**Please note: Funding for enhancements is significantly constrained due to the COVID pandemic.**

## Recommendations

**Primary (continued)**

- **R15: Hither Green Area Capacity:** Exploration of long term timetable and infrastructure options to deconflict services in the Hither Green to Lewisham/Tanners Hill Junction area. This will help to reduce the need to rationalise services, allowing Metro and Mainline frequency uplifts and improved performance. This would likely explore grade separation opportunities of multiple junctions and track remodelling, and is related to project R14.
- **R16: Signalling Enhancements**: Continue the Digital Rail programme to enhance signalling technology across the network. Also develop signal enhancement proposals on the Kent Metro network to allow for more 12-car operation—specifically in the Slade Green/Crayford area.

**Secondary**

All recommendations are subject to future demand projections

- **R17: Sussex Metro Platform Extensions:** To complement the strategy for full 10-car Metro rolling stock operating on Victoria Sussex Metro routes, this SOBC would explore tactical opportunities to extend more platforms to at least 10-car.
- **R18: New stations/interchange:** Continue supporting London Borough aspirations for new and improved connectivity, including Brockley Interchange, Camberwell new station, and Enhanced Services to Belmont.
- **R19: Chatham Mainline Enhancement:** Development of proposals to increase both Metro and Mainline frequencies between Bromley South and Victoria, such as Kent House—Penge East Loops. Would interface with the outputs of London Bridge Area Capability development.
- **R20: Herne Hill Small Layout Enhancement:** Should additional services between Sussex Metro and Victoria via Herne Hill be identified as the preferred option, an SOBC will be necessary to progress development. Dependency with outputs from R2, and likely done together with R19 to understand best routing for Victoria Metro services.
- **R21: Headway Reduction:** Subject to signalling renewal timelines, development of signalling enhancements to reduce headways will be necessary for multiple routes. (Likely linked with other developments, such as R8, R9, R10 and R14)

## Potential Future Strategic Studies

- **South East Mainline Strategic Study:** This study would consider the wider route requirements for South East Mainline services to meet capacity and connectivity aspirations. This would include Orpington-Tonbridge capability enhancements. If the R14 development is funded, then the priority of this study will increase as the outputs would be required for SOBC option development. Without R14, the study would focus primarily on minimum options, including performance improvement and off-peak enhancements.

# 9

# Conclusion

# Conclusion

## Value added in a COVID context?

The South London & Thameslink Service Improvement Strategic Study has identified priorities for rail development in South London in a changing and challenging context. The COVID pandemic has changed how people use the railway, but, as of May 2022, patronage was returning, with passenger numbers around 75 % of pre-COVID levels.

This document cannot predict the future. But what it can do is explain what is likely necessary to manage crowding under different post-COVID scenarios (Low, Medium and Pre-COVID). This study can therefore prepare the industry for the future, and adds value in a number of ways:

1. The scenarios present **an updated baseline** of likely required services and infrastructure, under different post-COVID recovery scenarios (-32 %, and -17 % impact to patronage). Real post-COVID recovery can be compared to these scenarios, and therefore quickly understand potential scale of future infrastructure and service requirements.
2. Infrastructure and service enhancements required across all, or a majority of, post-COVID scenarios, suggests it is **highly likely they will be necessary** in the future, and therefore are proposed for further development.
3. The study explores interaction of different service uplifts, and therefore potential 'problem areas' **where allocation of capacity must be strategic**, or where there may be trade-offs (such as the Blackfriars Bay platforms, or the Chatham Mainline into Victoria).
4. The study provides a view on external **aspirations**, which will likely continue to be relevant post-COVID, including on new stations and new connectivity.
5. The study demonstrates alignment to Transport for London's strategies, and a possible pathway to a **TfL's Metroisation** concept.

## There is opportunity in South London

The study does identify large scale schemes—that is inevitable when considering scenarios up to 2050. This includes terminal expansion which will almost certainly be required over the coming decades, with corresponding infrastructure upgrades such as signalling enhancements and grade separation.

But, the study also identifies smaller scale schemes and improvements which could be introduced sooner. This includes reactive service reinstatements post-COVID, resilient connectivity opportunities (such as enhancing the Wimbledon Loop frequencies), and opportunities to enhance the performance and flexibility of the current infrastructure, making the current train service work better for our passengers. Similarly, consistency with last departures, and improved off-peak and Sunday frequencies provide short term opportunities.

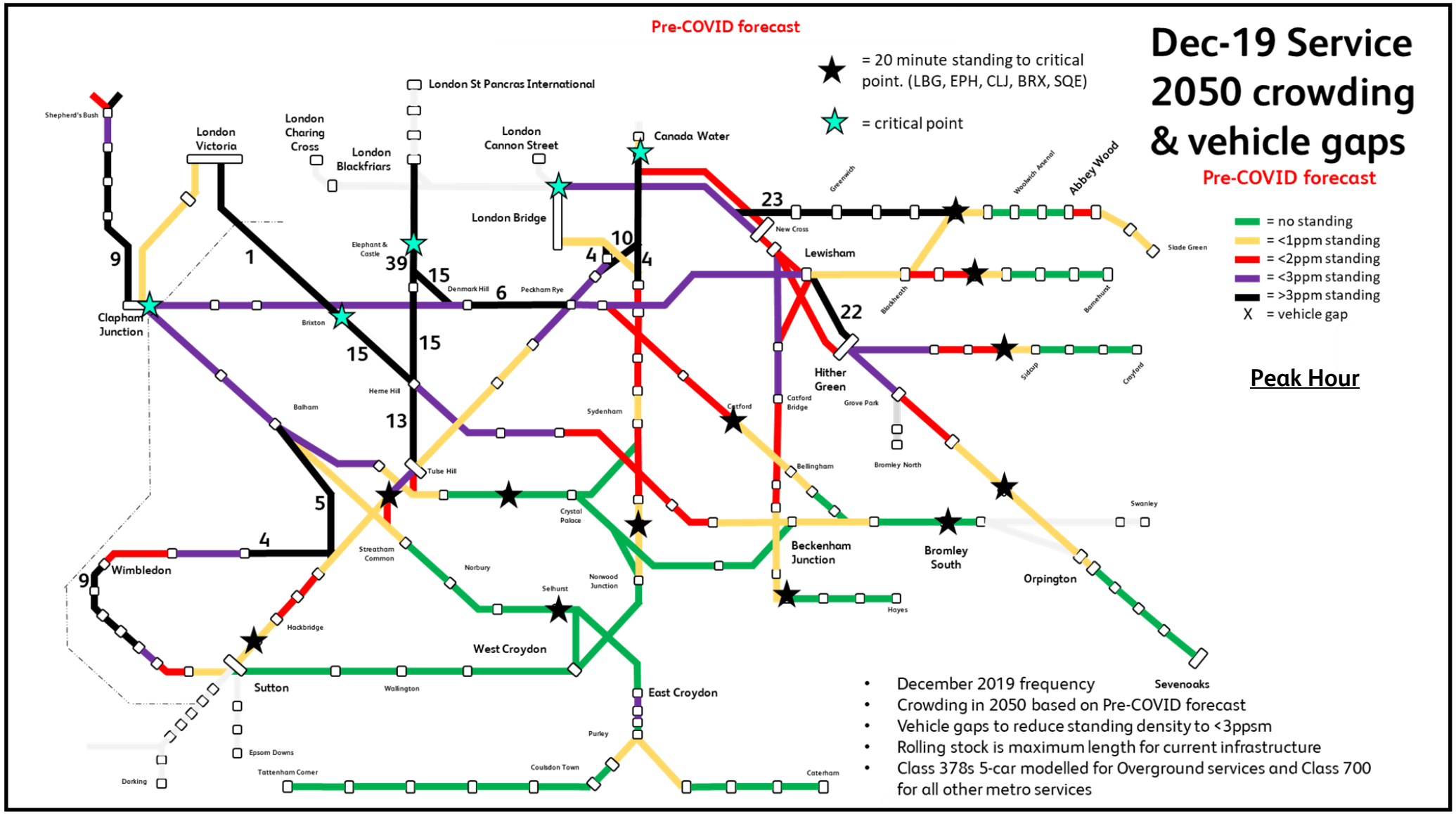
Rail is fundamental in supporting decarbonisation and modal shift, and allowing growth in housing and businesses. Rail has a bright future in South London and this study sets out what needs to happen to kick-start that journey.

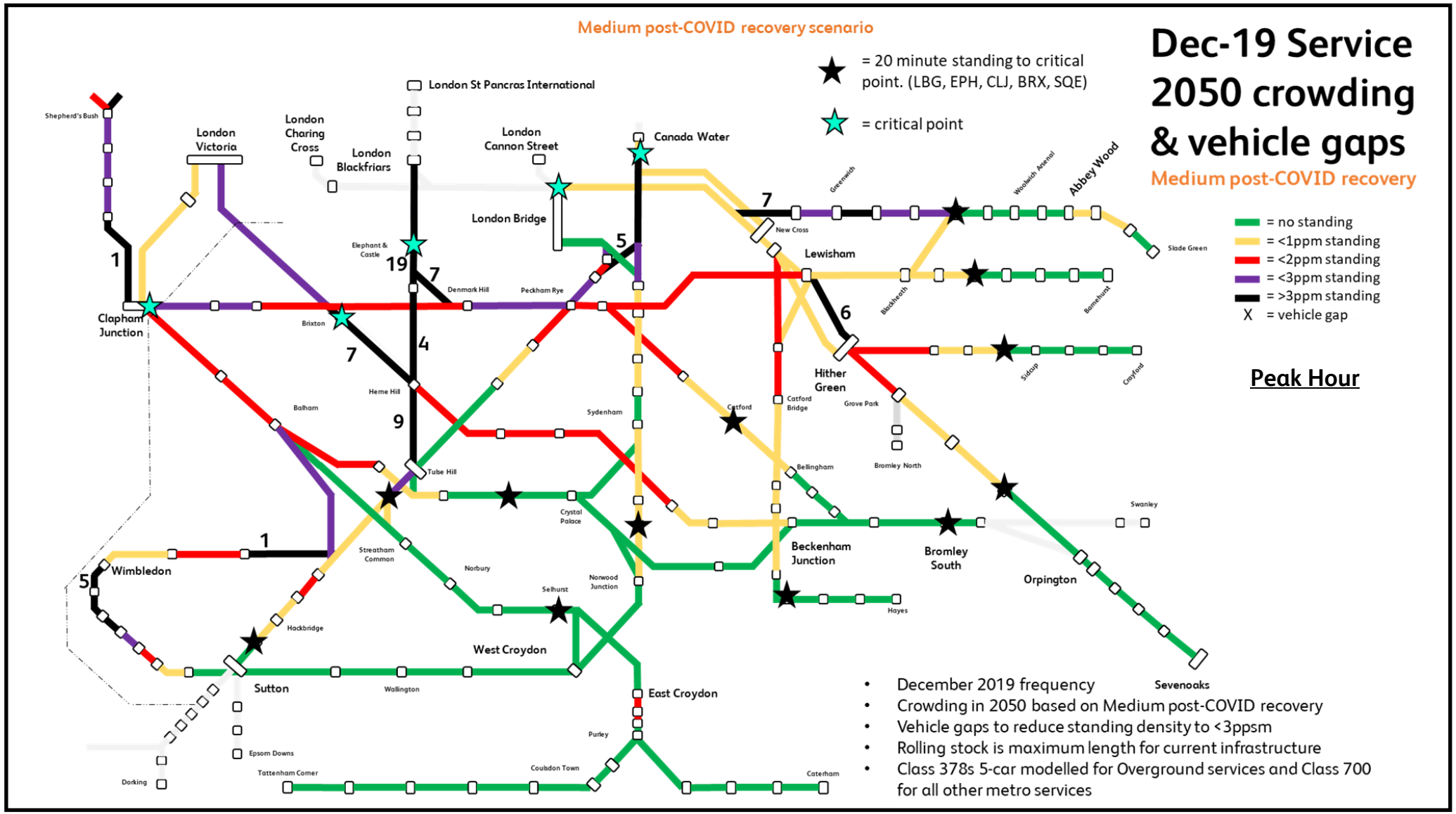
# 10

# Appendix

# Appendix: Service & Infrastructure Enhancement Summary

| ID | Service | Earliest Introduction Period | Dependency / Note | Enhancement Required |
|---|---|---|---|---|
| **No Infrastructure Enhancement Required** | | | | |
| **A1** | Redistribution of Kent Metro services | 2020s | Opportunity to create new base structure for Kent Metro providing new structure to add additional future services to. | Wider timetable rewrite. |
| **A2** | +2tph Wimbledon Loop - Blackfriars (extension of London Bridge service) | 2020s as demand recovers | Will likely require non Class 455 rolling stock to operate it. | Performance management. |
| **A3** | +1tph Kent Metro - Lewisham - Victoria | 2020s as demand recovers | Ideally in addition to current Victoria services, but may require redistribution of capacity at Victoria and Lewisham. | Performance management, wider timetable rewrite. |
| **A4** | +2tph Kent Metro / Catford Loop - Blackfriars | 2020s as demand recovers or 2030 | Ideally from Lewisham area in longer term but will require wider timetable rewrite. From Catford Loop (Bellingham) if crowding issue in short term. | Performance management, wider timetable rewrite. If to Lewisham and combined with A4, other **service rationalisation in Metro area may be necessary to avoid infrastructure requirements,** otherwise moves to 'large scale infrastructure enhancement required'. |
| **A5** | +1-2tph TfL Overground Dalston Junction - Clapham Junction | 2020s as demand recovers | | Improved Clapham Junction capability |
| **A6** | +1-2tph TfL Overground Highbury & Islington - Crystal Palace | 2020s as demand recovers | | |
| **A7** | +1-2tph TfL Overground Shepherd's Bush - Clapham Junction | 2020s as demand recovers | | None required if into platform 17 at Clapham Junction. |
| **Low—Medium Infrastructure Enhancement Required** | | | | |
| **B2** | +1-2tph Greenwich Line - Cannon Street | 2020s as demand recovers | No infrastructure upgrade if capacity redistributed, but otherwise enhancement is necessary. | Cannon Street Metropolitan Reversible berthing, potential redistribution of capacity, operational techniques. Otherwise, larger scale capability improvement. |
| **B3** | Wimbledon Loop even 4tph both directions to Blackfriars | 2030s/2040s | Removal of Wimbledon Loop - London Bridge service (A2). | Higher performance risk, so more thorough performance management techniques required |
| **B4** | +2tph Bromley South/Streatham via Herne Hill - Victoria | 2020s as demand recovers | Slowing of Mainline Kent services potential impact. | Potential country-end turnback requirements. If from Sutton, would require Herne Hill small layout enhancement. If creates pattern with 6tph 'Mainline' services, then requires Victoria capability improvement. |
| **B5** | +2tph Hackbridge Line - Victoria | Late 2020s, early 2030s | In place of above service (B4) operating from Sutton via Streatham to Victoria. | Signalling headway reduction, Victoria capability improvement. |
| **B6** | +1-2tph Willesden Junction to Clapham Junction | Late 2020s, early 2030s | Extension of service A6 | Willesden Junction capability improvement, timetable rewrite. |
| **Large scale Infrastructure Enhancement Required** | | | | |
| **C1** | +1-2tph TfL Overground Highbury & Islington - West Croydon | 2030s | Dependency with Croydon area bottleneck relief and other services extended from West Croydon to Wallington. | Croydon area bottleneck relief (ideally) & new turnback. |
| **C2** | +2tph Watford - East Croydon / Beckenham Junction | 2040/2050 | Crosses multiple Routes, each requiring separate enhancements. Complex service to upgrade. | Signalling headway reductions, improved Clapham Junction capability, AC/DC Changeover moved on West London Line, potential grade separation of junctions. Performance mitigations with WCML interaction. |
| **C3** | Additional Sussex Mainline services to London Bridge | 2030-2050 | Dependent on multiple enhancements, Croydon area bottleneck relief being the first. | Croydon area bottleneck relief, Brighton Mainline Upgrade, London Bridge area capability improvement after +4tph, signalling headway reduction on Sydenham Corridor after +4tph to London Bridge. Headway reduction on Wallington Line for new fast services. |
| **C4** | Additional Sussex Mainline services to London Victoria | 2020-2050 | Dependent on multiple enhancements, Croydon area bottleneck relief being the first. | Croydon area bottleneck relief, Brighton Mainline Upgrade, potential Victoria capability improvement after +2tph. |
| **C5** | Additional Kent Mainline services to London Bridge | 2030-2050 | Dependent on multiple schemes, London Bridge area capability being the first. | London Bridge area capability improvement necessary, or redistribution of some Metro capacity. Capability improvement south of Orpington. Upgrade St Mary Cray Junction, and potential track remodelling on South East Mainline into London Bridge. |
| **C6** | Additional Kent Mainline services to London Victoria | 2020-2050 | Should more Kent Mainline services operate from Swanley to London Bridge, the Victoria route may require less upgrade as less strategically important. | London Victoria capability improvement necessary. Kent House - Penge East Loops likely necessary if sufficient services cannot be upgraded to operate into London Bridge. |


Pre-COVID forecast
Dec-19 Service 2050 crowding & vehicle gaps
Pre-COVID forecast
= 20 minute standing to critical point. (LBG, EPH, CLJ, BRX, SQE)
= critical point
= no standing
= <1ppm standing
= <2ppm standing
= <3ppm standing
= >3ppm standing
X = vehicle gap
Peak Hour
London St Pancras International
Shepherd's Bush
London Victoria
London Charing Cross
London Blackfriars
London Cannon Street
Canada Water
London Bridge
Elephant & Castle
Clapham Junction
Brixton
Denmark Hill
Peckham Rye
New Cross
Lewisham
Greenwich
Woolwich Arsenal
Abbey Wood
Slade Green
Blackheath
Bamehurst
Hither Green
Sidcup
Crayford
Catford
Catford Bridge
Grove Park
Bromley North
Balham
Heme Hill
Sydenham
Tulse Hill
Crystal Palace
Streatham Common
Norbury
Selhurst
Norwood Junction
Wimbledon
Hackbridge
West Croydon
Sutton
Wallington
East Croydon
Purley
Coulsdon Town
Caterham
Tattenham Corner
Epsom Downs
Dorking
Beckenham Junction
Bellingham
Hayes
Bromley South
Swanley
Orpington
Sevenoaks
• December 2019 frequency
• Crowding in 2050 based on Pre-COVID forecast
• Vehicle gaps to reduce standing density to <3ppsm
• Rolling stock is maximum length for current infrastructure
• Class 378s 5-car modelled for Overground services and Class 700 for all other metro services


Medium post-COVID recovery scenario
Dec-19 Service 2050 crowding & vehicle gaps
Medium post-COVID recovery
= 20 minute standing to critical point. (LBG, EPH, CLJ, BRX, SQE)
= critical point
= no standing
= <1ppm standing
= <2ppm standing
= <3ppm standing
= >3ppm standing
X = vehicle gap
Peak Hour
London St Pancras International
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Crayford
Catford
Catford Bridge
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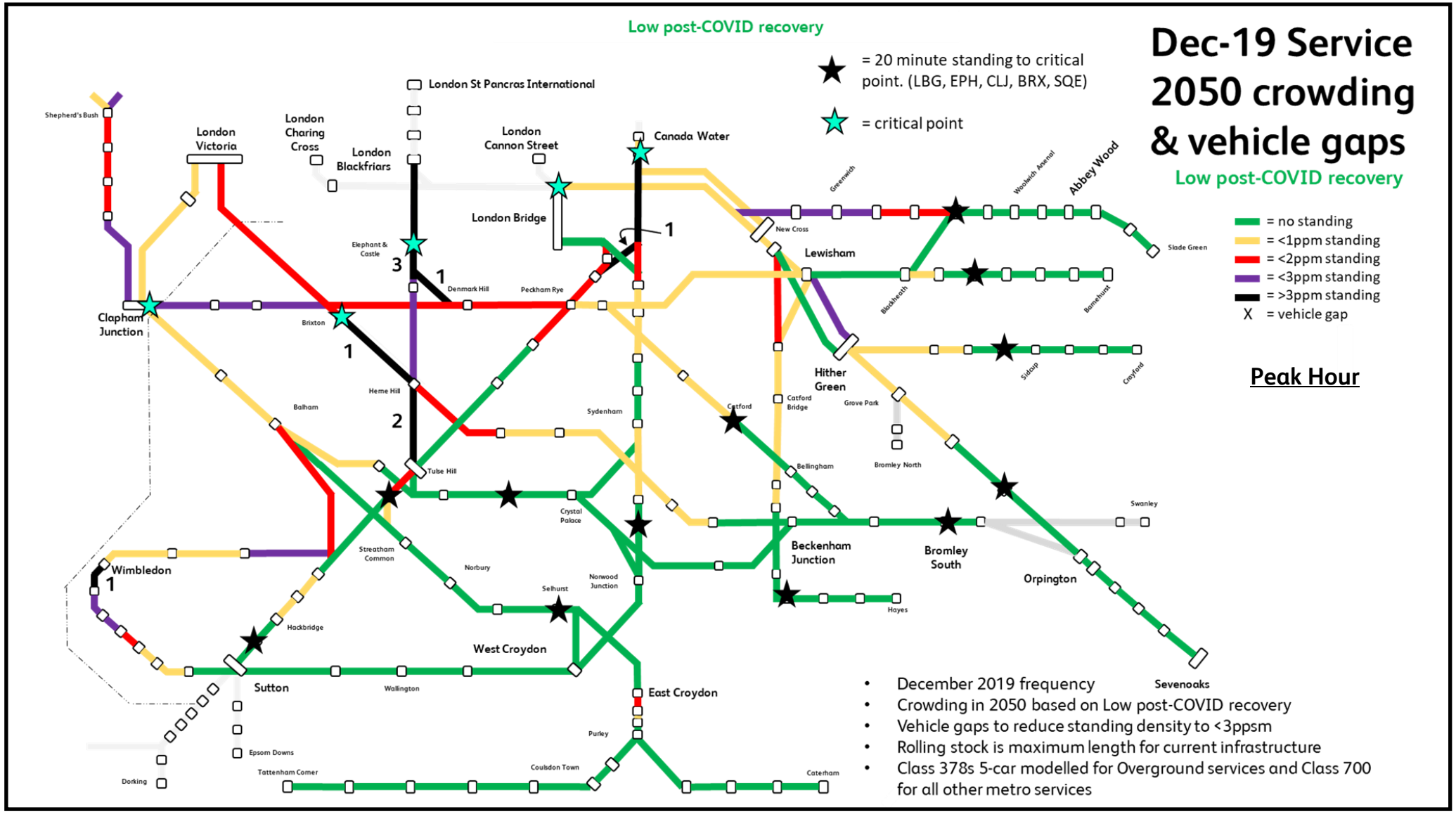
Bromley North
Bellingham
Beckenham Junction
Bromley South
Swanley
Orpington
Sevenoaks
Hayes
• December 2019 frequency
• Crowding in 2050 based on Medium post-COVID recovery
• Vehicle gaps to reduce standing density to <3ppsm
• Rolling stock is maximum length for current infrastructure
• Class 378s 5-car modelled for Overground services and Class 700 for all other metro services


Low post-COVID recovery
= 20 minute standing to critical point. (LBG, EPH, CLJ, BRX, SQE)
= critical point
Dec-19 Service 2050 crowding & vehicle gaps
Low post-COVID recovery
= no standing
= <1ppm standing
= <2ppm standing
= <3ppm standing
= >3ppm standing
X = vehicle gap
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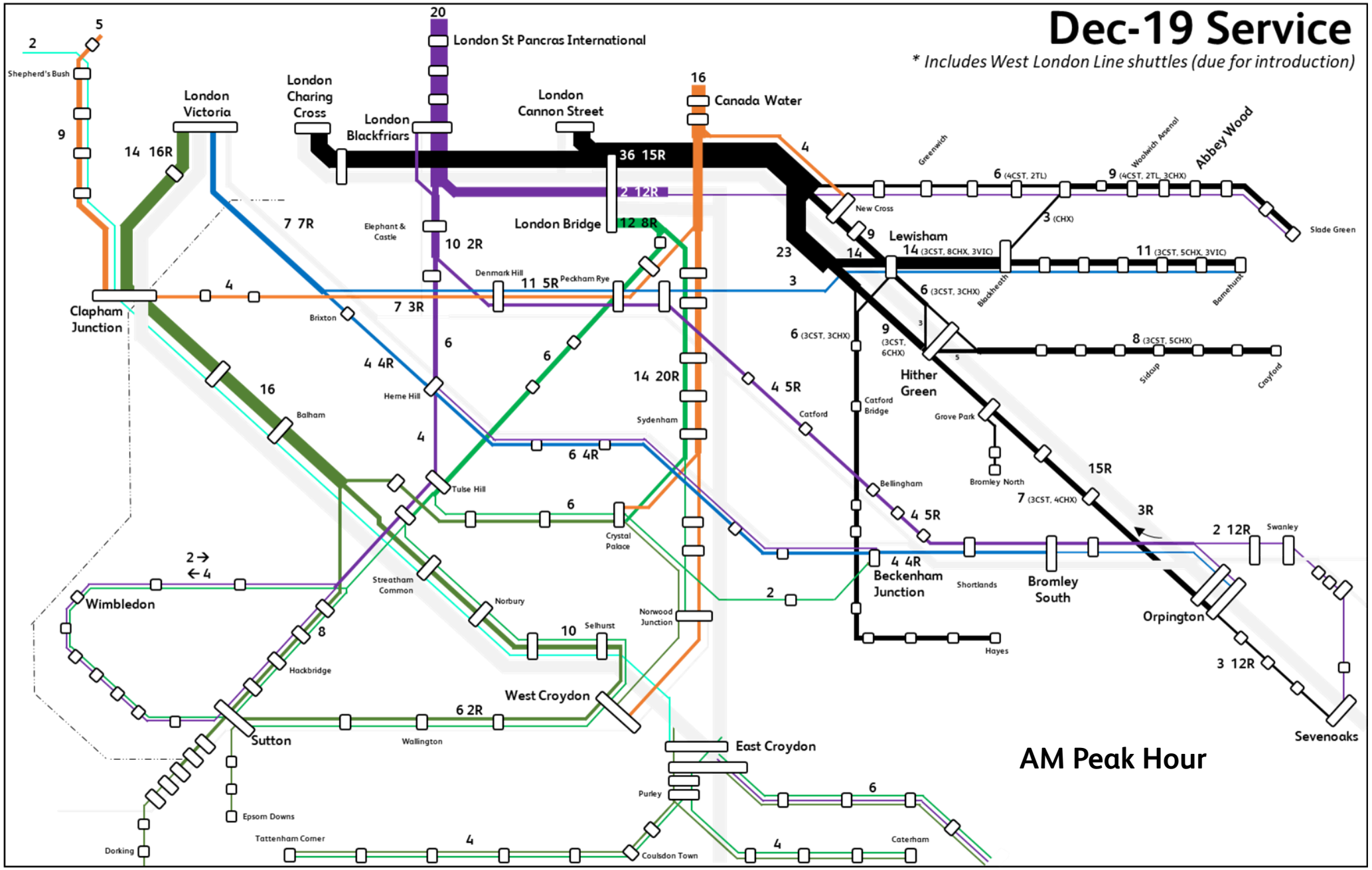
Bellingham
Beckenham Junction
Bromley South
Swanley
Orpington
Hayes
Sevenoaks
December 2019 frequency
Crowding in 2050 based on Low post-COVID recovery
Vehicle gaps to reduce standing density to <3ppsm
Rolling stock is maximum length for current infrastructure
Class 378s 5-car modelled for Overground services and Class 700 for all other metro services


Dec-19 Service
* Includes West London Line shuttles (due for introduction)
AM Peak Hour
London St Pancras International
Shepherd's Bush
London Victoria
London Charing Cross
London Blackfriars
London Cannon Street
Canada Water
Greenwich
Woolwich Arsenal
Abbey Wood
Slade Green
New Cross
Lewisham
Elephant & Castle
London Bridge
Denmark Hill
Peckham Rye
Clapham Junction
Brixton
Blackheath
Barnehurst
Hither Green
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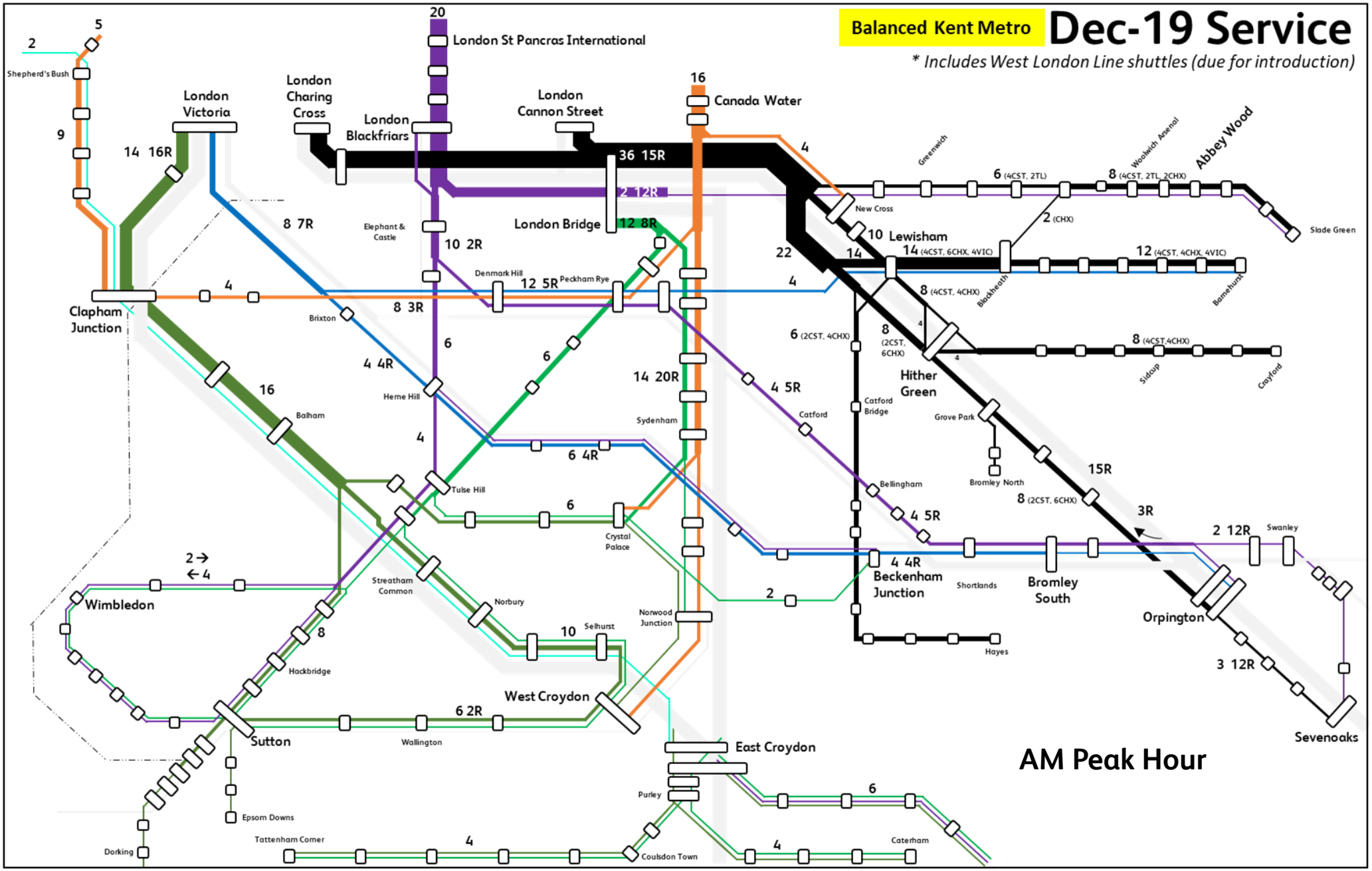
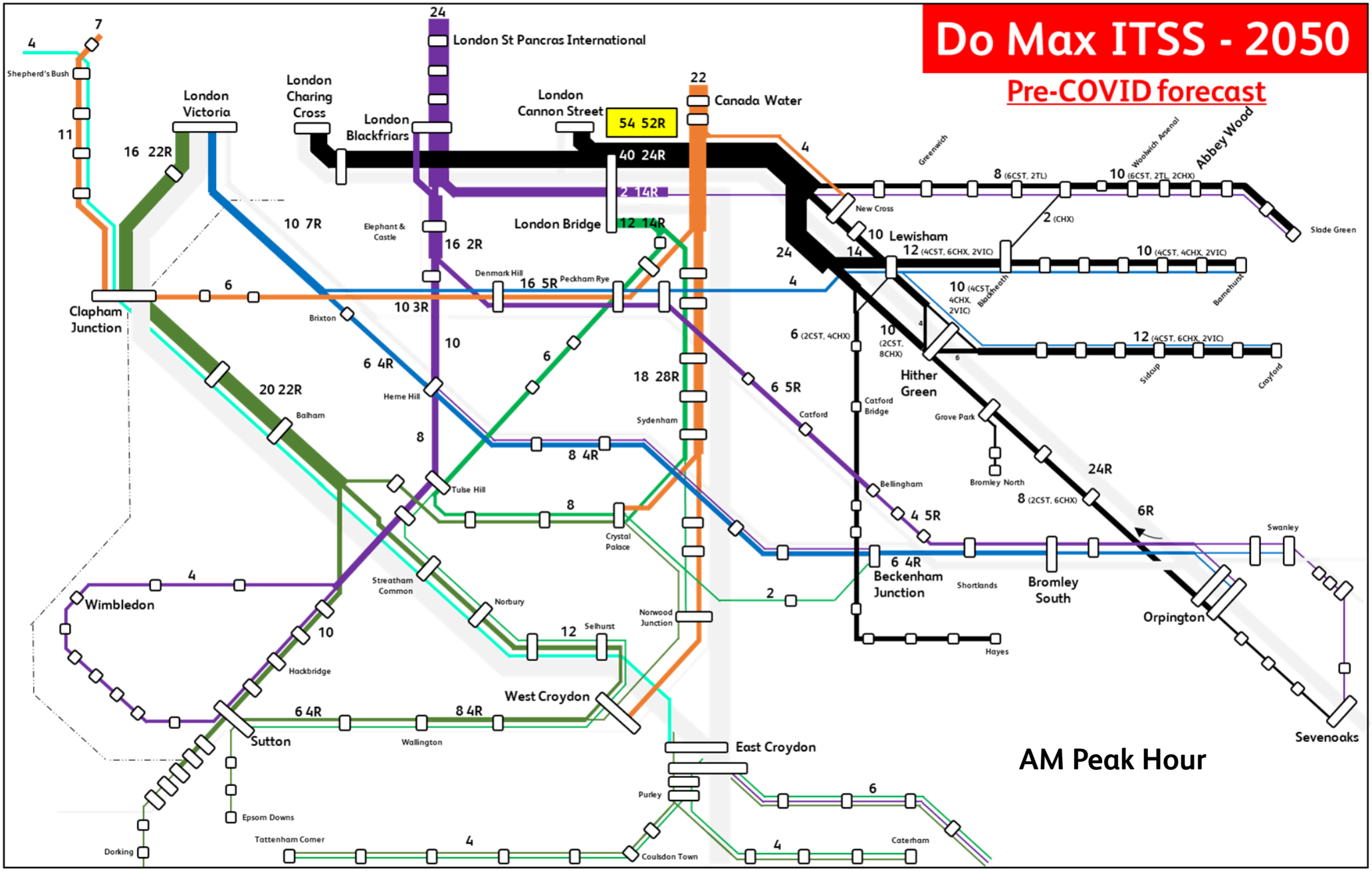



*Indicative ITSS to identify infrastructure constraints and does not necessarily present the 'real' train service that will be operated.*

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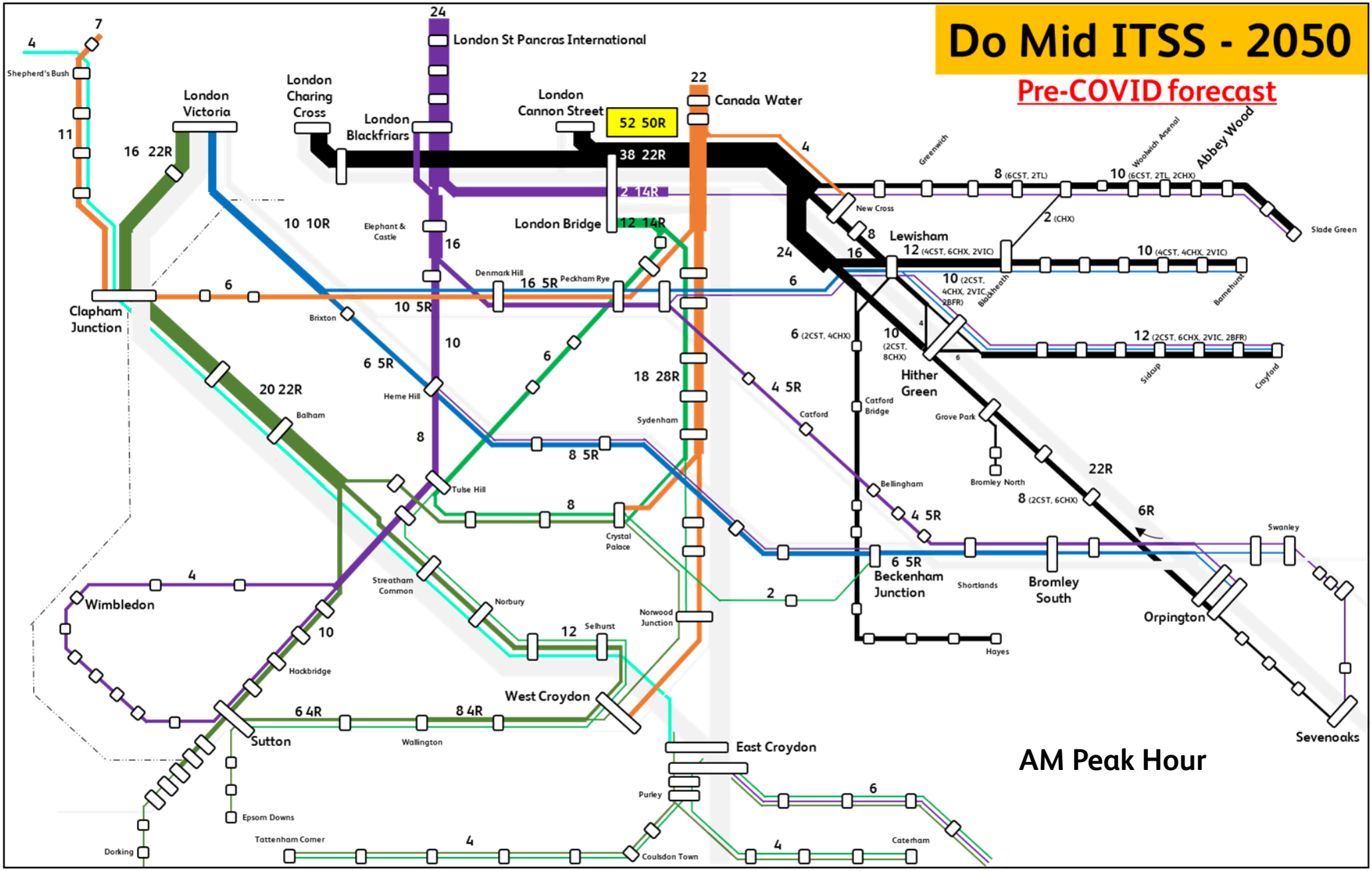


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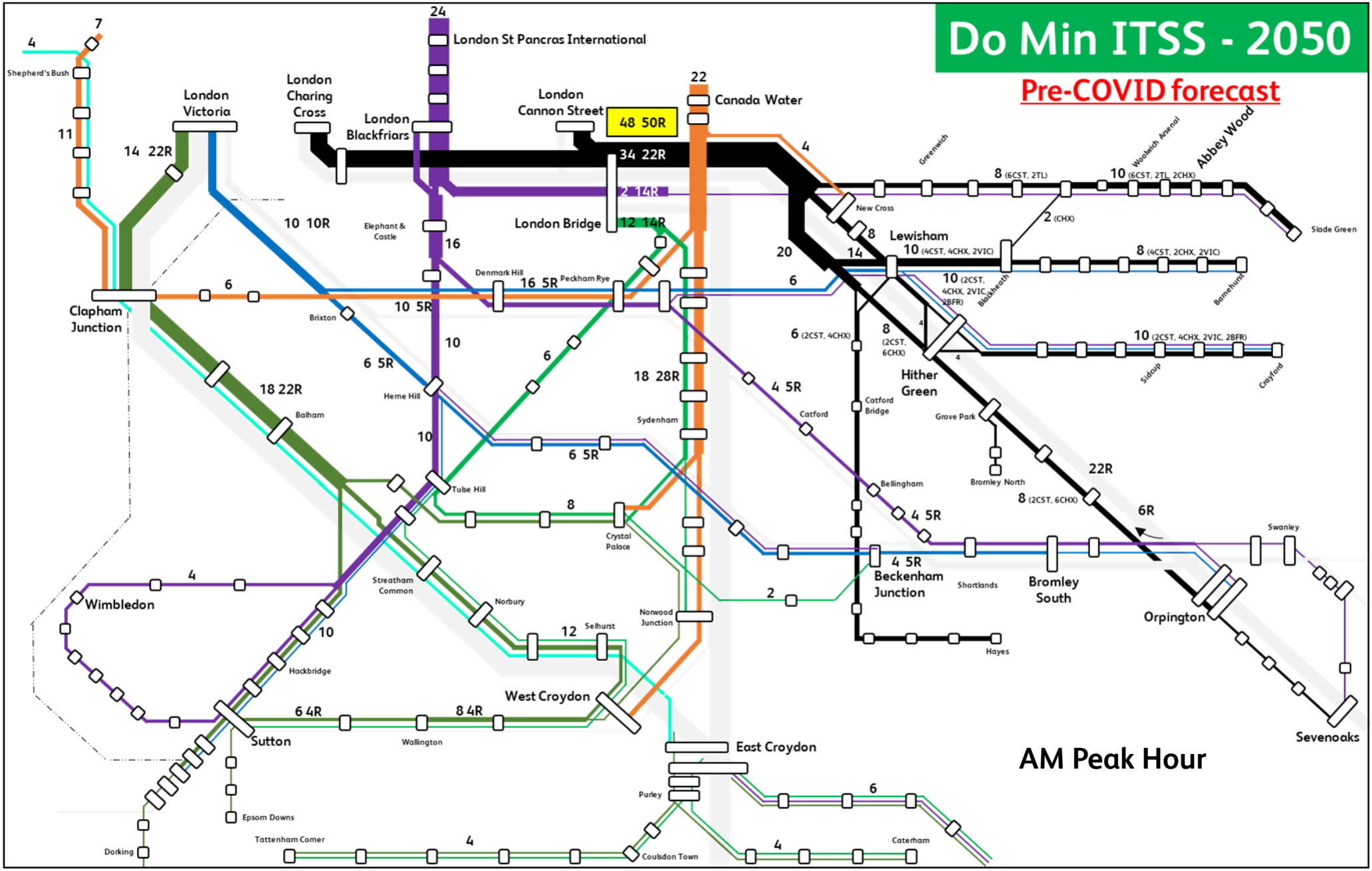


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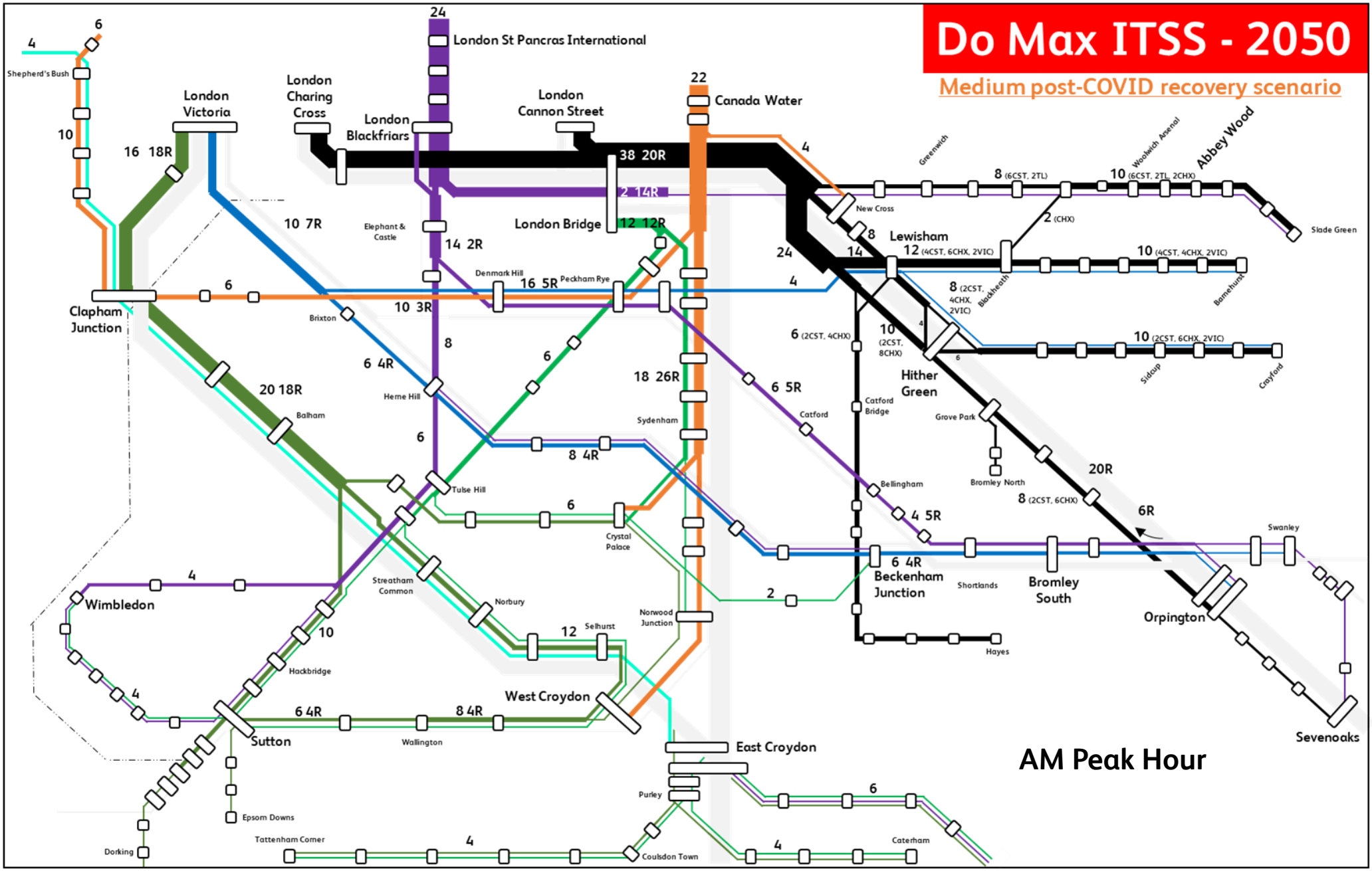


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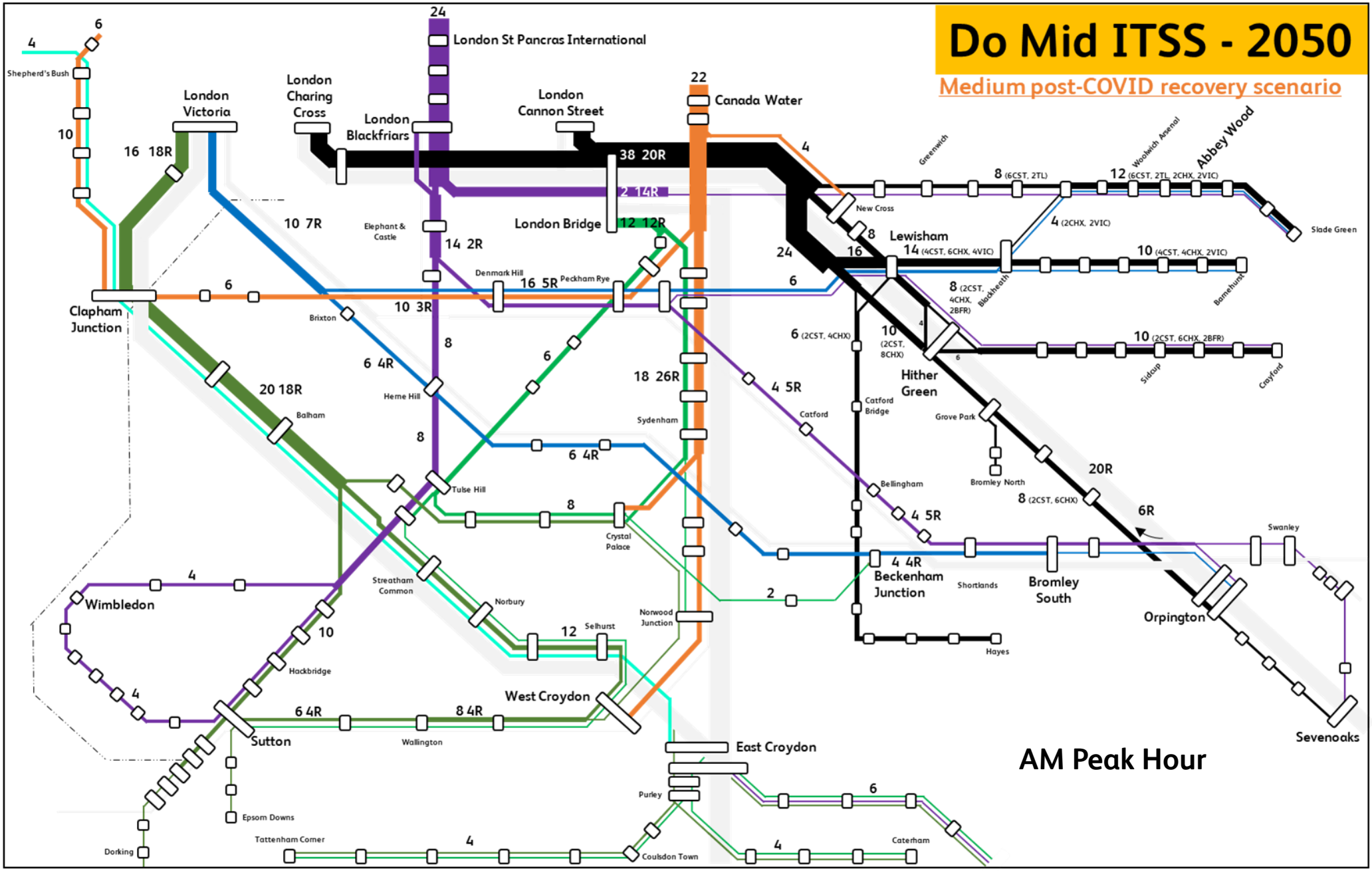


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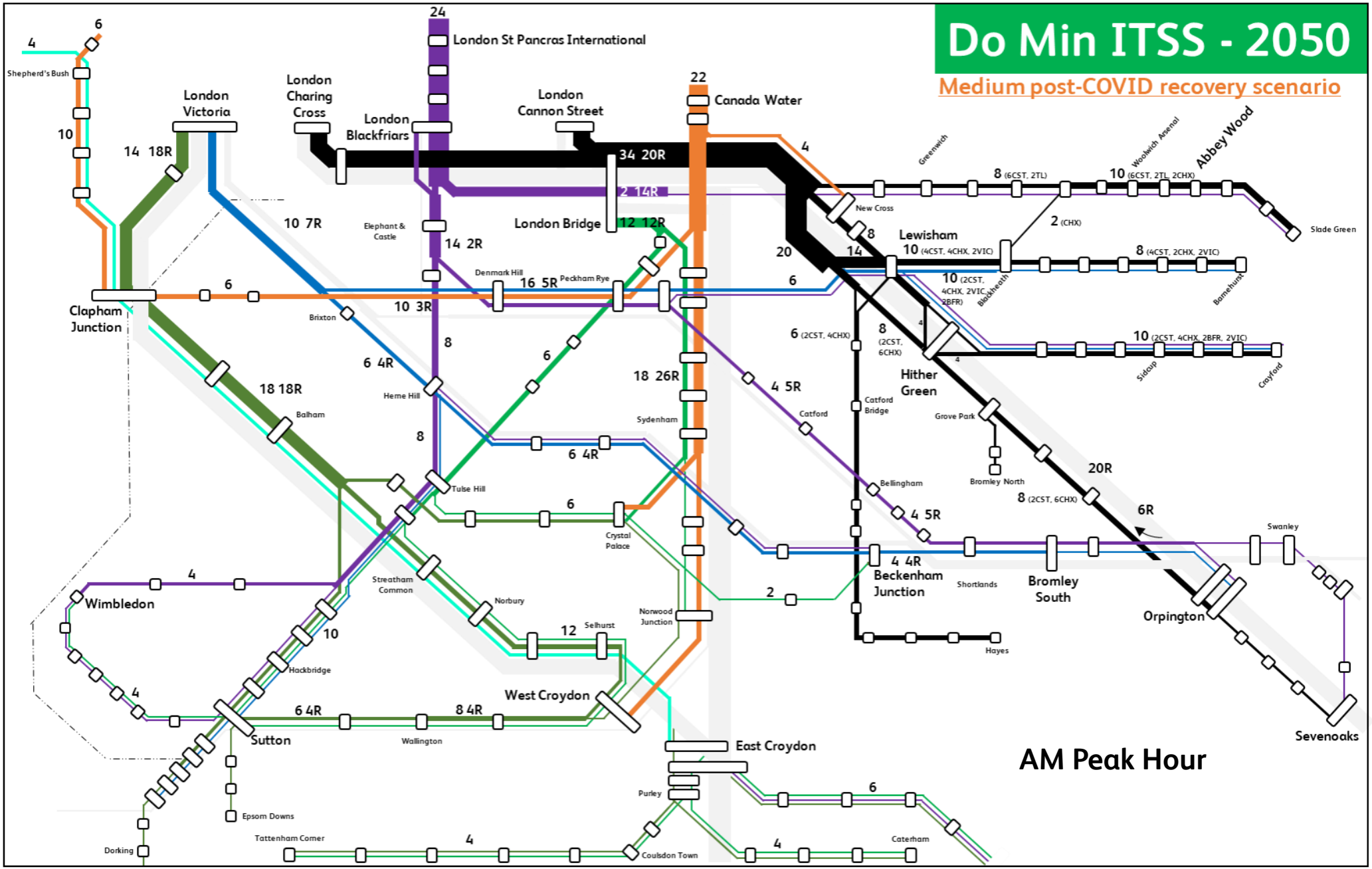


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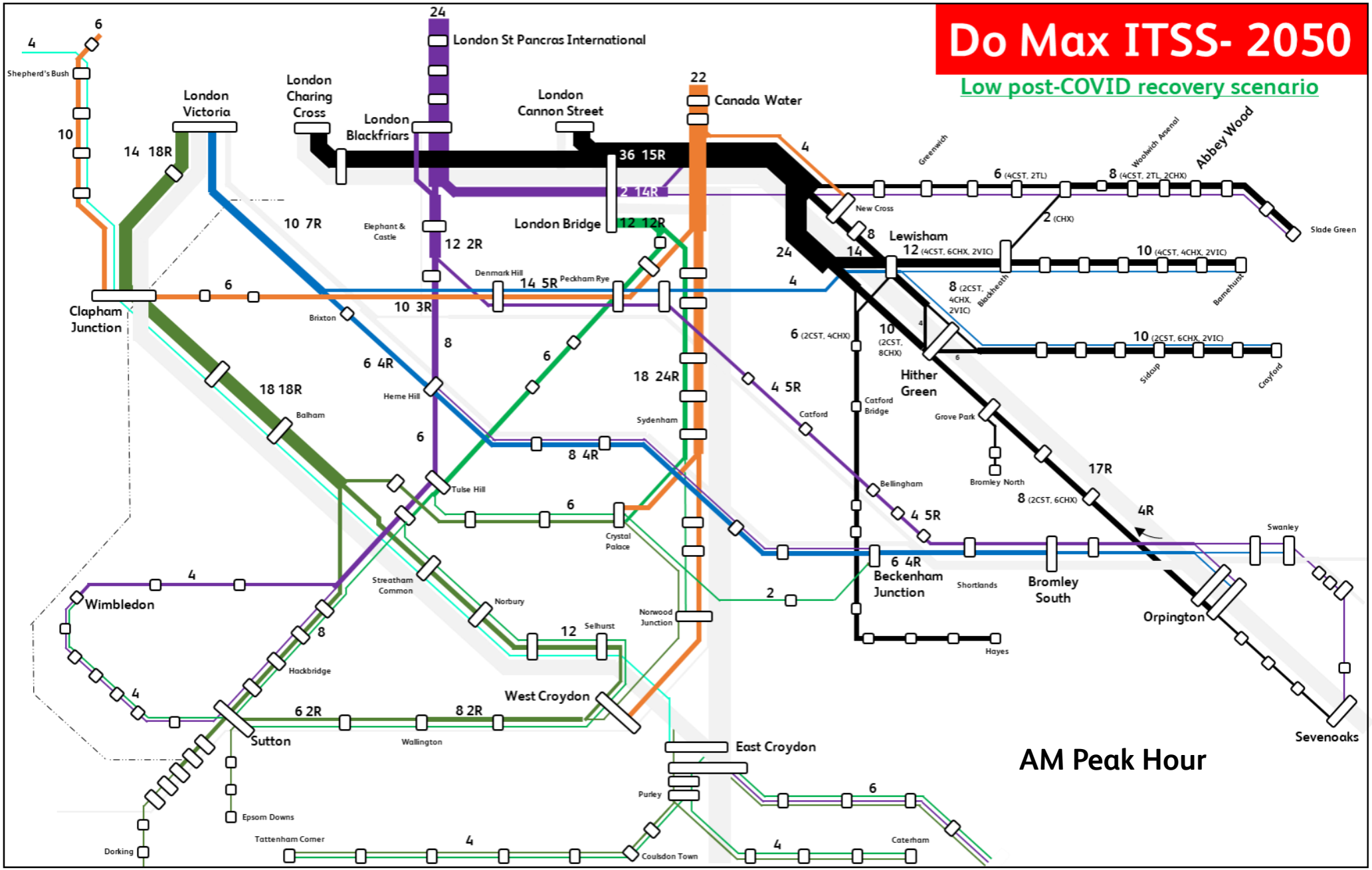


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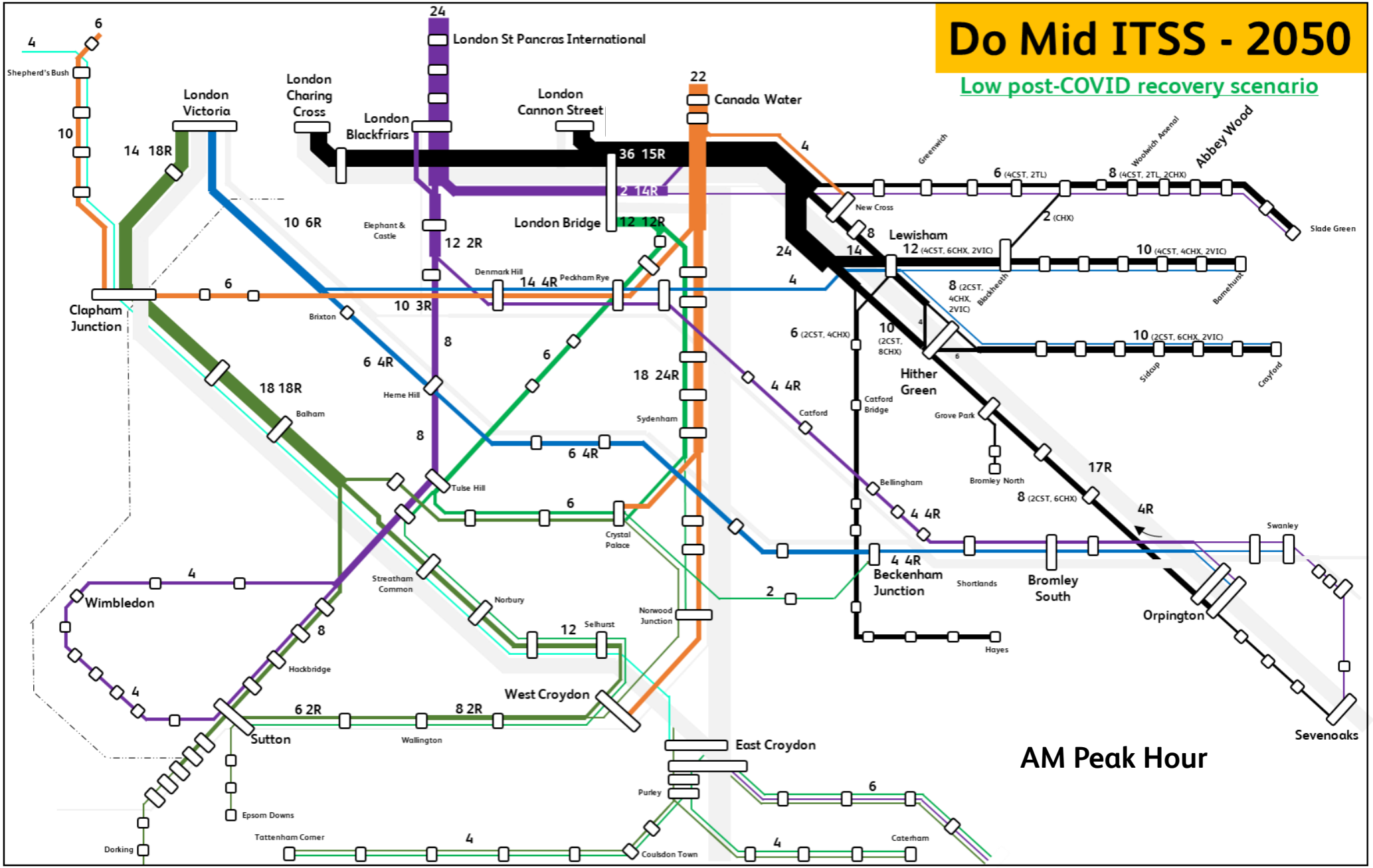


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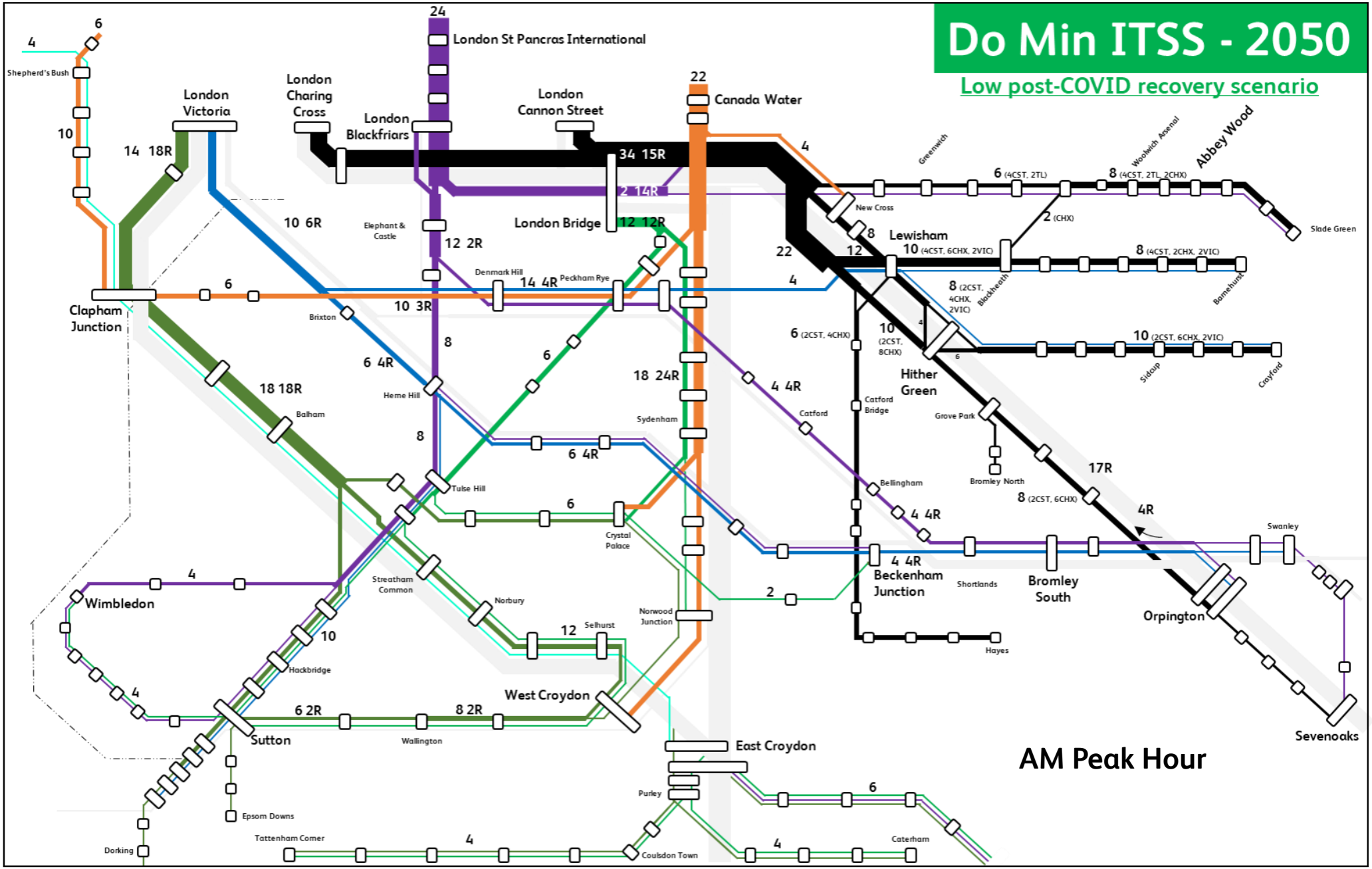


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