

London **East-West** Study

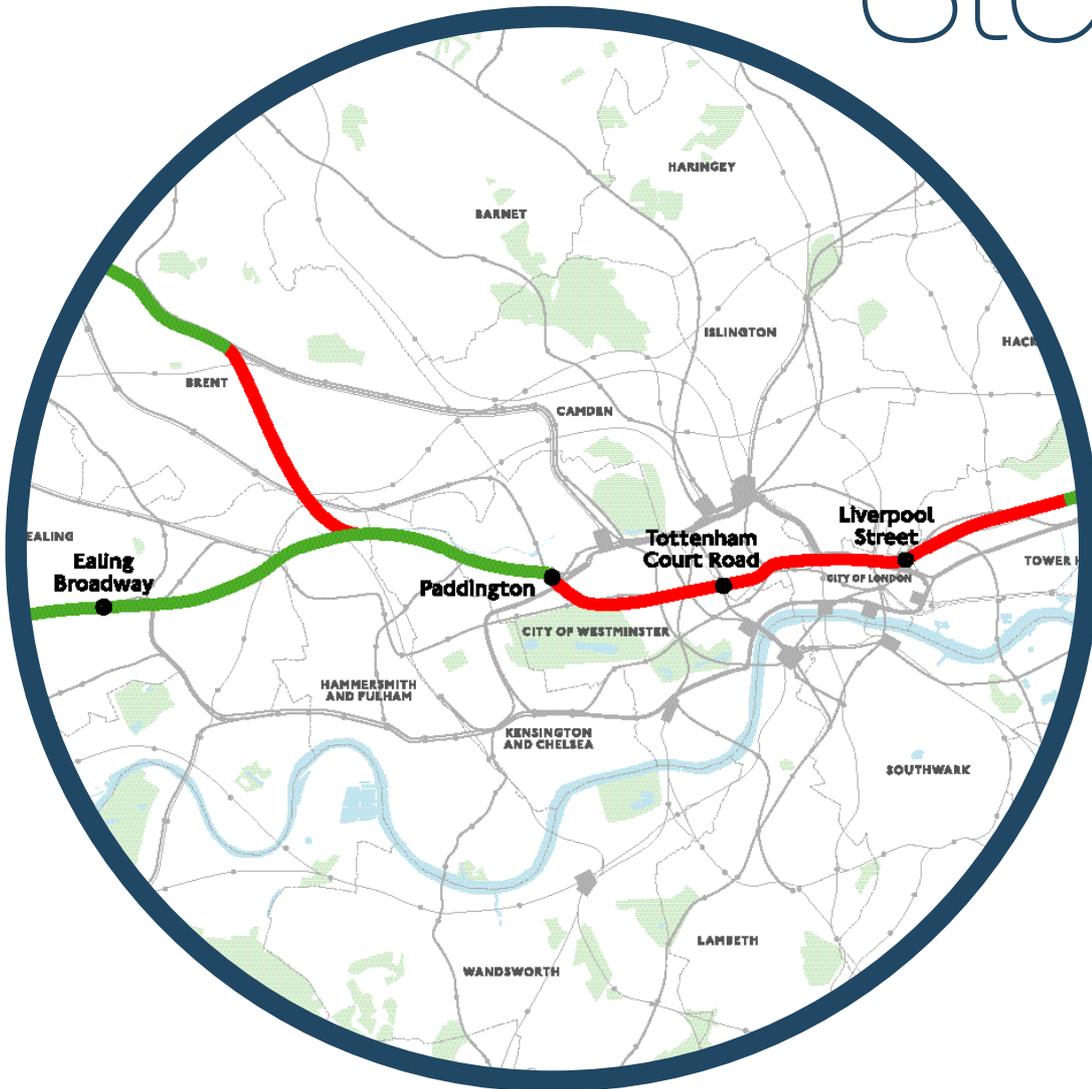


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Three appendices support this report and contain the following information:

Appendix 1 – Background information

Appendix 2 – Modelling and assessment – supporting information

Appendix 3 – Supporting tables and diagrams

1 Executive summary

1.1 Background

In December 1999 the Deputy Prime Minister asked the Shadow Strategic Rail Authority (sSRA) to carry out a review of the issues relating to rail travel on an East West axis across London.

This report, prepared in response to that request, sets out the issues such as network capacity, congestion, growth and regeneration. It identifies a programme consisting of complementary and incremental projects that will create a railway network appropriate to London's status as a World City.

The sSRA has worked with Transport for London, Railtrack and London Underground to clarify the issues, to identify opportunities and to frame a solution.

1.2 The current situation

The current system is near to capacity in terms of the National Rail Network, the central London termini and the Underground. This creates a fragile system where the slightest problem can have dramatic knock on effects across the network. To passengers the experience is unsatisfactory with frequent delays, sub-standard interchange facilities and overcrowded trains, platforms and termini.

1.3 Forecast growth

The sSRA expects the growth in demand for passenger and freight to continue to increase. Even if nothing is done to enhance the network, beyond the schemes already committed, we expect peak hour passenger growth to be around 15% in the next 20 years and off-peak travel to double in the same period. If additional schemes are implemented these figures will be higher. Freight is planned to increase by 80% within the next decade but will only do so if served by a convenient and cost effective network.

1.4 Government policy

When forecast growth is compared with the Government's 10 Year Plan target to increase rail travel by 50%, it is clear that the existing infrastructure, even supplemented by the committed schemes, will not deliver this growth.

Government policy is to encourage a switch from cars to sustainable modes including the railway. This requires a high quality public transport network. Rail also has a role to play in serving major development sites and assisting regeneration in areas such as the Thames Gateway. In producing this report we have taken into account the Mayor's objectives as set out in his Draft Transport Strategy published in late October.

1.5 New cross London routes

Proposals to reduce congestion based on upgrades of existing infrastructure were examined. These included:

- upgrading of the North London and South London lines;
- linking the northern half of the Circle Line to the National Rail Network;
- upgrading of the existing radial routes into Paddington and Liverpool Street.

None of these options would provide effective relief of overcrowding in Central London. This can only be achieved by new cross London links.

The sSRA identified three possible major schemes that would provide significant additional passenger capacity across Central London. These schemes are based on the safeguarded routes through Central London for the CrossRail and Chelsea-Hackney lines. These routes have been formally safeguarded for almost ten years and there is increasing pressure to release parts of both routes for building developments.

To varying degrees, these schemes will reduce congestion, assist regeneration and encourage modal shift. They are all economically viable with the most promising being a network based on a **new tunnel from Paddington to East of Liverpool Street**. We propose that this project is taken forward to the project definition and design development stage immediately. However, it should be recognised that this is a major construction project and as such is not expected to deliver benefits for ten to 13 years.

1 Executive summary (continued)

1.6 Service patterns

The sSRA has focused on the choice between two alternative service patterns for trains using the proposed tunnel:

- a Regional Express that would cater for middle distance commuters;
- a Regional Metro that would be predominately geared towards serving Greater London.

We propose that the **Regional Metro** option should be taken forward as it makes a greater contribution to social objectives and is likely to have higher levels of reliability.

1.7 Associated benefits

In addition to delivering benefits to passengers on the Great Eastern and Great Western Main lines, a new Paddington to Liverpool Street route would deliver:

- significant improvements in service to the Dagenham and Tilbury area;
- increases in services to the Lea Valley and Hackney;
- increased importance for Stratford as a railway hub.

1.8 Great Western Main line

The Great Western Main line will be required to carry significant additional traffic in future. This includes:

- Metro services from the Paddington to Liverpool Street line;
- increased freight traffic;
- increased Inter City traffic as a result of improvements being proposed to the Great Western route;
- increased rail access to Heathrow.

To deal with this traffic we propose that the **Great Western route should be six tracked**, at least to Airport Junction. This should be complemented by the redevelopment of the train shed at Paddington to allow longer trains to be run on some routes.

1.9 Access to Heathrow

We recommend that the following schemes progress to improve rail links to Heathrow Airport:

- a **Heathrow to St Pancras** service using the Dudding Hill line and the Midland Main line;
- the **Airtrack** group of services running through the

central area of Heathrow to link destinations to the North and South.

1.10 Freight and orbital passenger services

The Orbirail initiative is currently being progressed to increase orbital services around London to meet local needs. This includes the development of the following routes:

- the East London line and extensions;
- the West London line;
- the North London line.

In order to allow the Paddington to Liverpool Street and the Orbirail initiatives to proceed it is essential that proper provision is made for freight. We propose to develop a **freight focused route** incorporating the following developments:

- the Gospel Oak to Barking line to be upgraded;
- the gauge restriction in Hampstead Tunnel and the capacity issues between Hampstead and Willesden to be resolved;
- appropriate connections to be made to improve freight routes, possibly including a freight tunnel to the East of London.

1.11 Long term proposals

A rail link from South-West London to North-East London would complement the Paddington to Liverpool Street scheme. The sSRA and Transport for London will carry out a detailed feasibility study of the **Wimbledon to Hackney route**. This will commence in early 2001.

1.12 Delivery management

The projects set out in this report combine to form a cohesive whole and cannot be managed in isolation due to their inter-dependencies. For example:

- the cross London route requires the completion of the proposed freight corridor;
- Airtrack requires the six tracking of the Great Western;
- six tracking can only be designed when issues about the cross London route have been resolved;
- the Orbirail proposals interact with the freight corridor and Airtrack;
- the phasing, operability and buildability of all the elements affect each other.

For this reason we propose the creation of a Programme Office by the sSRA and Transport for London working together to take these schemes forward. This Office would draw on support from Railtrack and a programme management company.

1.13 Programme

The scale of the major schemes proposed in this report is such that they will take several years to come to fruition. In order to provide a world class transport system that will sustain the economic growth of London we strongly recommend that the proposals

are progressed immediately and that prudent measures are taken to minimise the time taken before the benefits can be delivered to the travelling public.

The following table provides a summary of the schemes that will contribute to improved rail travel on an East – West axis and outlines the actions we recommend.

Schemes	Recommended action
East-West passenger schemes	
<ul style="list-style-type: none"> • Paddington to Liverpool Street Regional Metro • Six tracking of the Great Western • Paddington ‘Span 4’ • Airtrack – including Heathrow to St Pancras • Platform lengthening – Great Western 	<ul style="list-style-type: none"> • sSRA and Transport for London to progress to project definition and design developments • Railtrack to complete feasibility study and proceed to obtain powers • Railtrack to complete planning application and proceed to development • sSRA to establish a Project Development Group and progress project programme • To be taken forward as part of the Train Operating Company refranchising process
Freight and orbital schemes	
<ul style="list-style-type: none"> • Orbirail • Upgrade of Gospel Oak to Barking - Phase 1 • Upgrade of Gospel Oak to Barking - Phase 2 • Improve links to West Coast Main line • Forest Gate flyover • East Thames Freight tunnel 	<ul style="list-style-type: none"> • To be taken forward as part of the refranchising process • Railtrack to proceed immediately • sSRA to establish a Project Development Group and progress to project definition • Project Development Group to carry out feasibility study • Project Development Group to prepare preliminary definition for safeguarding purposes • Project Development Group to prepare preliminary definition for safeguarding purposes
South/West to North/East London route	
<ul style="list-style-type: none"> • Wimbledon to Hackney 	<ul style="list-style-type: none"> • Take forward immediately as a joint study between the sSRA and Transport for London

2 The key issues

2.1 The passenger market

2.1.1 Peak period congestion

The study has quantified the everyday experience of the travelling public. The current network is operating close to its maximum capacity. Many trains are overcrowded and many stations suffer from high levels of platform congestion. With the network working so close to its theoretical capacity a single problem can often have severe knock-on effects that ripple throughout the system.

It is interesting to note that a recent study carried out by the International Stress Management Association showed that for Londoners their most stressful daily activity is the journey to work. This exceeds the stress of being at work.

Many lines in both the National Rail system and the London Underground are overcrowded and the

forecast growth in passenger numbers will increase the level of operational risk. The discomfort caused by this overcrowding is limiting the number of journeys made to work using the rail network. This in turn is leading to the suppression of demand on some key corridors. This suppression of demand will, if not checked, act as a brake on the continued economic growth of London.

Peak period congestion on the network has increased in the last five years. This is mainly due to economic growth over this period, but this effect has been exacerbated by restraint on rail fare increases. Even if this policy were to change it is unlikely that the increase in fares required to constrain demand would be acceptable either to the public or to policy makers.

On examination of individual lines and termini stations it is clear that capacity is restricted by pinch points on the lines, by the mix of traffic or by terminal capacity. Examples of the line capacity limiting the ability to increase capacity are the lines into Waterloo and Cannon Street. Examples of the terminal providing the restriction are at Paddington and Fenchurch Street.

The location of terminal stations around the periphery of Central London is far from ideal as this requires passengers to interchange on to the Underground or other modes to get to their final destination. For example, at Paddington 75% of passengers interchange on to the Underground. These changes create inconvenience and lengthen journey times. The existing network also discourages journeys across Central London so constraining employment opportunities.

Figures provided by Transport for London show that there are significant sections on each of the Underground lines where passenger numbers currently exceed capacity guidelines.

The impact on passengers of these high levels of utilisation is:



- Overcrowding and discomfort on train journeys;
- Poor reliability of train services;
- Some stations routinely closed for safety reasons.

Parts of the road system in London are even more congested than the railways. This presents significant difficulties for those movements that must take place by road. This includes local public transport distribution by bus, local delivery to businesses and movement of the emergency services. An important strand of Government and Mayoral policy is to discourage the use of private cars in central areas. Measures that are being proposed include road charging and workplace parking charges, but these measures are unlikely to be effective unless there is an acceptable alternative to the car. Severe overcrowding on the rail system reduces its attractiveness as an alternative.

A short term solution on some lines is to increase the length of the trains. This would require platform lengthening at stations. Such proposals form part of the franchise replacement process. However, the scope for this on the main East – West axis is limited.

The longer term solution is to improve access to Central London and to reduce overcrowding on the Underground by linking up the termini on opposite sides of the central area to allow through running.

2.1.2 Off-peak travel

During off-peak periods the challenge is to encourage greater use of the railway system thereby providing relief to other parts of the transport network and making better use of assets that would otherwise only be used in peak period. In the off-peak period there is a much better prospect of achieving modal shift from cars than in the peak period when many journeys are already captive to rail because of parking difficulties.

Although off-peak travel has been growing substantially over the last few years there are significant barriers to its further development. These include irregular or infrequent train services, a system that is difficult to understand and fears about security, particularly at night or at quieter stations. Many of these problems are also faced by London

Underground. Providing simplified passenger information, reliable and easy to understand interchange arrangements and most notably very frequent simple services have helped London Underground to address these issues.

On the National Rail Network service patterns for inner suburban services are complicated, particularly South of the Thames where many stations have services to several central termini making the service pattern difficult to understand. Trains on most routes are relatively infrequent with more than 15 minutes between trains and many stations are unmanned outside the peak. Off-peak travel has grown despite these problems but some of the significant social trends in terms of work and leisure patterns as well as policy initiatives such as road congestion charging indicate that there are prospects for it to grow at an even faster rate.

The proposals set out in this report are primarily aimed at addressing the problems associated with the peak hours. However, it should be recognised that there will be significant benefits to passengers in the off-peak period from the increased capacity and service frequency.

2.1.3 Future growth

In the last few years the trend has been of steadily rising rail demand. There is uncertainty about the reasons for this. Undoubtedly, consistent economic growth, with its implications for both employment and the availability of 'leisure money', have contributed. But it has occurred despite the perceived weakness of the rail network with regard to reliability and overcrowding, and may simply reflect the growing unattractiveness of car travel on congested roads.

It is forecast that there will be continued growth in rail travel. Work carried out in support of this study has predicted that, even if we do not enhance the network beyond the schemes already committed, growth in the peak period between 2000 and 2020 for National Rail Network travel in the South East will be about 15%. Growth in the off-peak period looks likely to be in excess of 100%. Overall growth,

2 The key issues (continued)

taking account of the balance between peak and off-peak trips, is likely to be of the order of 50%. This compares to the 10 Year Transport Plan target of a 50% increase in national rail usage by 2010.

Central London is forecast to continue to be the destination for two thirds of trips. The main destination in the peak period being the City (around 30% of all journeys to Central London). In the off-peak period the West End districts of Marylebone (including Oxford Street) and Westminster are the most popular destinations (about 45% of all Central London destinations).

Analysis of forecast peak hour journeys across London indicates that few travellers from East of the City have destinations beyond Hammersmith and that few travellers coming from the West have destinations beyond the City of London. The figures also demonstrate that the volume of journeys from the East is significantly greater than that from the West.

These forecasts include the effects of committed rail schemes such as Thameslink 2000, the Channel Tunnel Rail Link and the East London line. However, the logic within the forecasting model applies a capacity restraint mechanism deterring rail travel when parts of the network are overcrowded, and this has constrained the forecast growth. Additional information relating to the modelling of future growth can be found in Appendix 2.

The introduction of congestion charging in Central London is forecast to increase the 2020 peak forecast growth by a further 5% and off-peak by 10%.

When forecast demand is compared to existing capacity it is evident that the greatest mismatch occurs in Central London. Hence the priority for the study was to identify schemes that would provide significant additional capacity in the central area.

It has been suggested that the increase in commuting to Central London which has hitherto accompanied the expansion of the London economy will be less pronounced in future. This is because of the increase in residential population in the central area and the growth of 'telecommuting' where the use of telephone links allow workers to be based at home. There is some

evidence that these factors are having an impact but that it is limited.

The increasing number of Inner London residents are making many more leisure related journeys within London than would be made by those commuting from outside the City. Moreover, most Inner London residents use rail, particularly the Underground for journeys to work.

The overall effect of telecommuting on journeys to work is difficult to assess. It appears that the majority of telecommuters still find it necessary to make frequent journeys into their office, although these journeys are often made off-peak. This is one of the factors leading to growth in off-peak travel. Moreover there are a limited number of jobs that are suitable for full time telecommuting. A much more prevalent model appears to be that of workers spending most of their time in the conventional work setting, but using telecommuting for certain specific tasks. Although this trend will act as a suppressant on demand, particularly on journeys to work, it is unlikely to be significant in overall demand levels.

2.1.4 Regeneration

The London economy is of vital importance to that of the nation as a whole but its continued growth is of particular significance to the inhabitants of London and the surrounding areas. Despite generally increased prosperity there are substantial pockets of deprivation. A key objective of the Mayor of London is to regenerate these areas.

Effective transport links are vital in stimulating regeneration, but the current overcrowding of the rail network makes it difficult to envisage new links being provided using the current infrastructure.

The key areas where regeneration opportunities exist are West London (for example Park Royal), Lea Valley, Hackney, Stratford and the Thames Gateway. We have sought to identify schemes that improve access and network capacity in these areas.

In developing the strategy we have taken account of the major redevelopment sites such as Paddington Basin, Kings Cross and Docklands and sought to provide improved access to these areas where possible.

2.1.5 Town Centres

Although consideration of travel within London tends to focus on the central area, the structure of the city is much more complex. London is a collection of closely grouped towns for example, Croydon, Ealing, Kingston, Staines, Lewisham and Stratford, dominated by the City and Westminster. Many of these towns are significant in terms not only of population but employment and recreation opportunities. Although most of these centres have good links to the Central London this is by no means universally true. Moreover direct links between the centres are often poor where they exist at all. We have endeavoured to take due account of town centre developments in this study.

Development of these centres is important in terms of improving the quality of life of their residents and reducing the need for long distance travel. It would also allow the development of travel patterns that are 'counter peak'. Improved public transport links play a key role in supporting this development.

Several town centres are rail transport hubs in their own right and these, together with other centres, form part of a strategy being developed by sSRA, Transport for London and Railtrack for development of a network of strategic interchanges.

2.2 Freight

Rail freight transport is planned to increase dramatically over the coming years. It is planned that there will be an 80% growth in net tonne kilometres by 2010. The provision of effective routes and operating conditions is key to ensuring that freight is attracted away from road transport.

There are freight flows that originate in various parts of London or have their destination there, but there are also significant flows that use the National Rail Network to pass through London en route to other destinations. Although these flows have only a minor direct impact on the central London termini they do influence some of the flows in the outer London area.

The specific major flows passing through London are deep-sea container traffic from the Haven ports, Felixstowe and Harwich, intermodal and container

traffic from North and South Thameside, including Thamesport, Dagenham, Tilbury, the proposed container terminal at Shellhaven, and Channel Tunnel traffic. A large proportion of this traffic is bound for the West Coast Main Line via Willesden. All of these services currently use the Great Eastern and North London lines or the South London network and the West London line.

Freight trains are not normally permitted to run in the peak periods because of the congested nature of parts of these routes. This effectively means that for two three hour periods of each day there are no significant freight movements through London. The only exception to this is Channel Tunnel traffic that is entitled to use certain routes as set out in the Channel Tunnel legislation. This barrier to movement often leads to trains sitting in the yard at Wembley for excessive periods. As freight demand continues to grow it will be difficult to handle the traffic on offer and maintain the peak period ban on movements. Moreover the delays to delivery time which are caused by these bans present particular difficulties to freight forwarders and inhibit growth in the rail freight market. We also envisage greater levels of congestion during the off-peak period as passenger and freight journeys continue to grow.

A scheme, supported by the sSRA, is currently under preparation to upgrade the line from Felixstowe to Nuneaton, specifically for the purpose of diverting some of the container traffic from the East coast ports to the North by a more direct route. This will take away the majority of the Felixstowe traffic but some, for instance freight bound for the West Country, will still have to pass through London.

In addition to freight passing through London there is freight having its origin or destination within London. Generally these flows are quite diffuse between the various corridors into Central London and can be managed during the off-peak period. Many of them consist of aggregate or waste traffic that is less time sensitive than container or other logistic traffic.

2 The key issues (continued)

The flow of aggregates from the West Country to Acton Yard is particularly relevant to the East – West study. Trains on this line are relatively frequent as long trains are brought into the Yard where they are split to leave in two or three portions. Trains entering Acton Yard must move at a slow speed and tend to block back onto the Great Western Main line causing congestion and reduction in capacity.

2.3 Heathrow

The continued growth in the economic health of London relies not only on making London a good place to work and live, but also on London's ability to compete in a global marketplace. This means that London must continue to improve its attractiveness as an international destination and its ability to provide a fast and effective transport network to overseas destinations.

Whilst the London airports of Gatwick, Heathrow, City, Luton and Stansted continue to expand and develop it is important that an integrated transport network exists to effectively carry the travelling public to and from the airports and their major destinations. It is also necessary to cater for the large number of people that work in and around major airports.

Total passenger numbers at Heathrow airport are currently about 65 million per annum of whom about one third are interlining. This means that approximately 42 million passengers are arriving at or departing from the airport each year. Expressed another way this means that about 58,000 passengers leave the airport every day needing onward transportation. This number is likely to increase substantially if consent is given for the construction of Terminal 5 at Heathrow.

Road traffic congestion in the vicinity of Heathrow is heavy. Further development of the airport, including Terminal 5, is likely to depend on minimising further increases in road traffic. In order to achieve this there is general recognition that improvement of rail links, beyond the existing London Underground and Heathrow Express services, represents the best opportunity to achieve modal shift from the car.

Of the 58,000 passengers flying into the airport each day about 30,000 are non UK residents and are therefore prime candidates for the use of public transport. A significant proportion of these is heading for London, mainly to the hotel districts in Westminster, Camden and Chelsea. A distinguishing feature of air travellers is that they tend to have large amounts of luggage. In order to prevent delays and crowding on platforms it is desirable to separate airport services from other passenger services.

In addition to air passengers there are a large number of 'meeters and greeters' who use cars to access the airport. Although the nature of this segment of the market makes it difficult to achieve much market penetration by public transport, there is some scope for those originating in London.

There are about 80,000 people working in airport jobs in the Heathrow area and at least as many again working in nearby associated business such as hotels and freight forwarders. This is another important market that public transport, with the exception of relatively short bus journeys from nearby centres such as Hillingdon, has not penetrated. Rail could make an important contribution towards the service of this market.

The area around Heathrow is becoming an important business centre in its own right. Many businesses with the need for extensive overseas travel have relocated in the area and many of the hotels around Heathrow are used for meetings between executives flying in from overseas and their UK based colleagues. This is also generating significant potential business for rail in the area.

Most of these potential markets have the virtue of being spread throughout the day but with the exception of the air passengers and the 'meeters and greeters' their destinations at Heathrow are scattered over a wide geographical area.

2.4 Great Western Renaissance

The Great Western Main line has experienced strong growth in passenger numbers over the last five years. As a result plans are being prepared by Railtrack for the Great Western Renaissance. This is a programme to increase capacity at significant pinch points on the route.

This programme has started and is expected to be complete by 2009 at which point the main (fast) lines into Paddington will be totally occupied by main line expresses plus the four per hour Heathrow Express trains.



3 The long term vision

During the study we found that there was a high degree of agreement in the long term view of the sSRA, Transport for London, London Underground and Railtrack on the principles for new lines in London. This long term view is summarised below:

- Rail must be a vital part of a London wide, comprehensive and integrated public transport service;
- Individual services should operate on dedicated lines running to similar service patterns to give the highest possible throughput;
- There should be a clear hierarchy of services that distinguishes between, for example, local, regional and national services. Each level of service should have a unique visual identity;
- Dedicated freight routes are vital if the expected growth in rail freight is to take place;
- Local services should have simplified service patterns that should stop at all stations and offer 'turn up and go' frequencies;
- There should ideally be no more than three branches at each end of individual services, with grade separation at the principal junctions;
- High quality interchange with all relevant public transport modes is required;
- Destinations should be planned to avoid passengers accumulating on tunnel platforms.

These principles will lead to improved operational efficiency of the system and provide a more attractive and effective public transport network for passengers.

The sSRA reviewed all the proposed schemes against these principles.



4 The strategic choice

This section sets out our proposals for passengers and freight. In order to provide adequate capacity for the future development of the rail network a number of projects need to be taken forward in a co-ordinated manner. Whilst we deal with each of these projects separately, there is a close relationship between all of them that requires a holistic view of their development.

4.1 The central cross London schemes

4.1.1 Infrastructure and alignment

The study identified that the existing National Rail and Underground networks are operating close to capacity both in terms of train movements and passenger flows. On the National Rail Network this is particularly true of the Great Eastern Main line and the South West Main line. On the Underground this is most acute on the Central and Victoria lines. The capacity of the system is dictated by various pinch points at locations where services converge or at the central termini.

There is little opportunity to provide the significant increase in network capacity required to support the forecast growth in rail travel by upgrading the existing system. We examined schemes for upgrading existing routes by lengthening platforms, increasing frequencies and adding additional tracks. We also re-examined the proposed Integration Project previously proposed by Railtrack to link the Northern half of the Circle Line with the National Rail Network. Whilst some of these schemes could make a contribution to the relief of local congestion or could form part of a bigger programme, they fail to deliver the additional capacity required to significantly reduce overcrowding. Therefore our proposals focus on providing a new route through the central area that would relieve the most severely overcrowded parts of the Underground network whilst also addressing the constraining bottlenecks on the approaches to the National Rail Network termini.

Our proposals for new cross London tunnels envisage 24 trains per hour which provides significant additional capacity to the system. This is emphasised

when compared to a traditional ten trains per hour suburban service.

A new route that allows through running of services that currently terminate at the termini on the West to the services that currently terminate at the termini on the East would have the following benefits:

- It would take passengers closer to their final destination without the need for interchange;
- It would release capacity at the termini allowing additional trains to be run.

To connect the Central London termini requires a tunnel for which there are relatively few feasible alignments due to the presence of building foundations, existing underground tunnels and obstructions. The best opportunities, in terms of feasibility and speed of implementation, are provided by the two safeguarded routes (CrossRail and Chelsea – Hackney). We identified three possible routes using these corridors. These were:

- A tunnel from the West (portal at Royal Oak) to the East (portal at Bow) with intermediate stations at Paddington, Bond Street, Tottenham Court Road, Farringdon and Liverpool Street. This would allow the Great Western Main and Chiltern lines to connect to the Great Eastern Main and London, Tilbury and Southend lines. Whilst this alignment has similar features to the original CrossRail proposal, the position of the portals and the design of the stations are likely to be different to those of the earlier scheme.
- A tunnel that connects Wimbledon (portal at Raynes Park) to Liverpool Street (portal at Bow) via Clapham Junction, Victoria, Bond Street, Tottenham Court Road and Farringdon. This would allow through services from South West Trains to the Great Eastern and London, Tilbury and Southend lines.
- A tunnel that connects Wimbledon (portal at Raynes Park) to Leyton (portal at Hackney Wick) and to Finsbury Park (portal at Drayton Park) via Clapham Junction, Victoria, Tottenham Court Road, Kings Cross and Hackney. This would allow South West Trains to connect to the Central line and routes to the North.

4 The strategic choice (continued)

We have made the following assumptions:

- The tunnel diameter would be designed to accept National Rail Network rolling stock powered by a 25kV overhead electrification system;
- The tunnel would be signalled and equipped to reliably handle 24 trains per hour in each direction with 8 or 12 car trains (18 trains per hour in the off-peak period);
- The rolling stock would be purpose built to allow fast rates of boarding and alighting;
- Depending on the surface routes connected to the tunnel, the rolling stock might also need to use the 750V DC third rail electrification system;
- Tunnel and trains would be fitted with modern protection systems eg ATP;
- Facilities would be designed to provide operational resilience (for example, turnbacks at the tunnel portals);
- Station design would meet capacity and emergency evacuation planning standards;
- The stations and the trains would be designed to meet current requirements for disabled access.

4.1.2 Service patterns

For each of the three routes we defined two service patterns. A Regional Metro service would serve the area roughly bounded by the M25 corridor and Central London. This would have frequent services and would stop at every station en route. As far as possible it would use dedicated track not shared with other operators. This would have the advantage of creating a self contained service making it more robust and reliable.

The alternative is a Regional Express service pattern. This would serve some inner London passengers but would also serve longer distance passengers using parts of the National Rail Network shared with other operators. This is more attractive from a funding perspective due to the higher fare revenues.

By diverting inner suburban services into a tunnel the Regional Metro options release terminal capacity for more long distance trains to use the termini. Conversely, the Regional Express options would release terminal capacity for the inner suburban

services. We have specifically located the tunnel portals, for example at Bow rather than at Liverpool Street, to permit this.

The combination of Regional Metro and Regional Express service patterns with each of the cross London tunnels gives a total of six options each of which has been assessed at a high level. The definitions of the six options are set out in Appendix 3, table 1.

These were developed in detail because the mechanics of the modelling used to predict the impacts require a precise input specification. However, we should stress that the detailed assumptions about service patterns associated with each option are no more than illustrations of concepts and are intended to inform the decision between the tunnel alternatives and the Regional Metro, Regional Express choice. They are not specific proposals, nor have they been tested for operational feasibility. The detailed design of service patterns would form part of the project definition stage.

The route for each of the options is shown in figures 1 to 6 on pages 28 to 31.

4.1.3 Associated benefits

The benefits arising from a new link would not be confined to the services using it. Services diverted onto the new link will vacate capacity at the terminal stations allowing services from other lines, which currently use the same terminus to be increased. We have defined these as the 'associated benefits'. The associated benefits assumed for each of the options are shown in Appendix 3, table 2. The cost – benefit assessment of the options includes the associated benefits.

An example of this would be the option of increasing train frequencies on the Southend line of the London, Tilbury and Southend system as a result of diverting most of the Tilbury loop trains through the new central area tunnel. This example is replicated on all of the radial lines affected by these proposals.

A particular benefit of the schemes serving Liverpool Street with a tunnel portal at Bow is to allow services from the West Anglia Main line from Stansted and Bishops Stortford to run via Stratford. This could be

Table 1 – Economic assessment (all figures are preliminary)

(All costs are in £ millions)

Option number	Paddington-Liverpool Street		Wimbledon-Liverpool Street		Wimbledon – Hackney	
	Regional Metro	Regional Express	Regional Metro	Regional Express	Regional Metro	Regional Express
	(1)	(2)	(3)	(4)	(5)	(6)
Capital Cost	£2,800	£2,300	£4,400	£4,200	£5,300	£5,300
Present value of Benefits (50 years)	£6,900	£6,800	£8,700	£8,900	£7,100	£8,200
Net Present Value (50 years)	£4,400	£4,500	£5,500	£5,300	£3,500	£4,100
Benefit Cost ratio (50 years)	3.2	3.8	2.9	2.9	2.1	2.2
Sensitivity check: 50 Year NPV if Capital Costs increase by 60%	£3,200	£3,600	£3,800	£3,800	£1,500	£2,100
50 Year NPV if there is a delay in timescales by three years	£3,800	£4,000	£4,800	£4,600	£3,000	£3,600

Notes:

The figures include the capital cost, the rolling stock costs and the operating costs.

Capital costs have been discounted at 6% per annum in calculating the NPVs.

The benefits include the direct and associated benefits and include time saving for existing users, reduced congestion on trains, revenues from generated travel, relief of road congestion and in road accidents.

The capital costs are high level estimates and as such are likely to have an accuracy of –10% to +60%

The Net Present Value is the net economic benefit (ie total benefits less total cost).

Option 1 does not include the cost of a tunnel from Old Oak to Neasden that would be required for services to Amersham. We have not included this cost in the calculations in order to allow a like-for-like comparison of the Regional Metro and the Regional Express options. The cost of the tunnel and the associated works is £600 million. A decision on the need for this and the actual services will form part of the project definition stage.

Additional notes on the assumptions and the models used for the forecasting and high level assessment are contained in Appendix 2.

done without any time penalty and would allow access from these areas to Stratford. Moving these trains away from the Hackney Downs route, where currently most of them do not stop, would allow more services to be run on the Chingford line and Southbury loop, helping to meet one of the Mayor’s important regeneration objectives in the Lea Valley.

4.1.4 High level economic assessment

All six options are viable propositions with a positive net present value and respectable cost/benefits ratios. They each make a contribution, to varying degrees, to the key objectives of reducing overcrowding, supporting regeneration and enhancing the transport network in London. The high level economic assessment of the options is shown in table 1 above.

4 The strategic choice (continued)

Table 2 – Summary assessment

Option number	Paddington-Liverpool Street		Wimbledon-Liverpool Street		Wimbledon – Hackney	
	Regional Metro (1)	Regional Express (2)	Regional Metro (3)	Regional Express (4)	Regional Metro (5)	Regional Express (6)
Impact on Rail Passengers	••	••	•••	•••	•	•
Impact on car use and Environmental Objectives	•	•	•••	••	••	••
Impact on Regeneration and Social Objectives	•••	••	••	•	••	•
Operability	•••	••	••	••	••	•
Risk	•••	•••	••	••	••	••
Timing	••	••	•	•	•	•

Key • adequate •• good ••• very good

Note:
Impact on rail passengers is based upon reducing journey times, interchanges and overcrowding.

The Paddington to Liverpool Street options do not give the greatest benefit but give the best return on capital expenditure because of the lower capital cost.

The two sensitivity tests show that the overall economic benefits of all the options remain substantial, even if capital costs are increased or timescales slip. The relative ranking of schemes does not change between options.

4.1.5 Qualitative assessment

The options were also assessed qualitatively against a number of criteria. The table 2 above sets out the relative strengths of the options against criteria. Appendix 3 contains the supporting tables.

4.1.6 Commentary on the qualitative assessment

All the options reduce the generalised rail journey time and would generate additional rail journeys through modal shift from cars and by creating new journeys.

The Paddington to Liverpool Street options:

- have the highest proportion of travellers that will benefit from fewer interchanges;
- are likely to generate the least short term disruption to established passenger travel patterns;
- the Regional Metro is best at supporting regeneration given its penetration of West London;
- can be brought into operation more quickly and with least risk.

The Wimbledon to Liverpool Street options:

- do most to reduce Central London interchange;
- have the greatest impact on road traffic congestion relief;
- offer a better balance of impacts on passengers once construction is complete;
- would not provide full relief of congestion;
- would prevent the subsequent construction of either of the other two routes.

The Wimbledon to Hackney options:

- are best at reducing overcrowding on the network;
- would generate a significant volume of interchange at Tottenham Court Road, principally onto the Central line. This would require the capacity of both the Central line and the station to be examined to ensure they could cope both safely and with adequate passenger comfort.

The Regional Metros:

- are more robust from an operational point of view as they can be run as contained services;
- are also more desirable from the point of view of long term sustainability, consistency with land use planning policy and social inclusion objectives;
- are consistent with the Mayor's Draft Transport Strategy.

The Regional Expresses:

- are best at reducing car usage;
- would extend the catchment area of Central London and encourage longer distance commuting;
- yield higher fare box revenues because of longer journeys involved.

4.1.7 Recommendation

In the light of the assessment it is our recommendation that the Paddington to Liverpool Street Regional Metro should progress to the project definition stage and should form the backbone of the 20 year programme. The reasons for selecting this option are as follows:

- provides significant relief to overcrowding in Central London and on the Great Western and Great Eastern Main lines;
- provides direct access from the West to the West End and the City;
- provides direct access from the East to the West End;
- assists the regeneration of West London eg Park Royal, Wembley and Paddington Basin and the Thames Gateway. It also seems likely to do more to reduce social exclusion on both sides of Central London;
- the infrastructure uses a similar alignment to a safeguarded route that should provide a lower level

of risk than the other options;

- causes the least disruption to existing travellers;
- supports the creation of Hubs at Ealing Broadway and Stratford;
- allows the subsequent construction of a South West – North East scheme such as options 5 and 6;
- the likely programme to the opening of the scheme will be shorter than the other options given the preparatory work that has already been undertaken by London Underground.

4.2 Heathrow and Great Western Main Line

4.2.1 Access to the Heathrow area

Heathrow Airport is a major determinant of road traffic patterns in West London. Reduction of traffic in the area of Heathrow depends on increasing the share of surface access taken by public transport. Apart from the general desirability of reducing traffic, consent to expand the Airport will depend on achieving modal shift away from the private car. Experience, both in this country and overseas, demonstrates that the rail offer is the most effective in increasing the shift to public transport. These factors dictate the need for a substantial improvement in rail access to Heathrow.



4 The strategic choice (continued)

A scheme exists for the extension of the existing Heathrow Express line from the central area of the Airport, under the site of the proposed Terminal 5 to join up with the South West network in the Staines area. It is envisaged that this would be constructed as an adjunct to the Terminal 5 works and would only proceed if consent for Terminal 5 is forthcoming. This link, together with the network of services that will use it, is known as Airtrack.

A more immediate proposal exists for additional Heathrow Express services to run from the Airport to St Pancras. In addition to six tracking of the Great Western Main Line this will require electrification of the Dudding Hill line and other significant works. St Pancras would form part of a 'Super Hub' including Kings Cross, possibly linked to Euston by a people mover, serving the East Coast Main line, the Midland Main line and Thameslink. It is expected that the St Pancras to Heathrow service would ultimately consist of four trains per hour. When Airtrack is complete these services would form part of the Northern leg of the network. We suggest that a frequency of four trains per hour is the minimum realistic service level for this route.

The sSRA recommends that Airtrack including the Heathrow to St Pancras link is progressed via a Project Development Group.

4.2.2 Great Western Main line

The introduction of two train per hour Heathrow to St Pancras service is possible without any major works on the Great Western Main line but provision of higher frequency services would require additional tracks. Other pressures on the Great Western Main line arise from the aspiration of the Train Operators to increase services and from proposed freight increases. Taken together even excluding the proposals for an East West link, these developments will require additional tracks to be constructed.

Construction of additional tracks will inevitably require powers and will be a long process. It is recommended that the feasibility study which has been carried out by Railtrack should be developed further such that an application for powers under the Transport and Works Act can be made as soon as is

practical. It should be noted that constructing an additional two lines on an extremely busy railway will be a complex task and the details will be subject to extensive study of phasing and 'buildability'.

Some relief of track capacity could be provided if Thames Trains, the suburban operator, was able to operate longer trains and if there was some change in the Passenger Service Requirements (PSR) for the Paddington suburban routes. Thames Trains cannot run a significant number of longer trains unless something is done to ease the problems caused by the short platforms at Paddington and other stations. Railtrack has developed a scheme to address the platforms at Paddington by redeveloping the Northern span of the train shed. This project will afford significant benefits and is at the outline design stage. We recommend that this scheme should be taken forward by Railtrack as quickly as possible to allow longer trains and optimal service patterns.

4.2.3 East West links to Heathrow

There have been suggestions that it would be appropriate for a new East West link to connect to Heathrow. Whilst this would seem to be at first sight a sensible connection there are issues as to whether a cross London tunnel link is appropriate for an airport link and whether such a connection optimises the use of the limited rail facilities at the Airport. There are also operational issues particularly with a Regional Metro associated service running through Heathrow.

Most foreign originating travellers arriving at Heathrow heading for London are bound, at least initially for the hotel districts of Westminster, Kensington and Camden. Relatively few are heading directly for office destinations in the City. A large proportion of passengers complete their journey by taxi and require good interchange to this mode.

There are also a significant number of budget travellers, the so called 'back-packers' heading for Central London. Although this market is not catered for by the current, premium fare, Heathrow Express it is a potential market for rail. The ultimate destination of these passengers appears to be widely dispersed. With the information available it is difficult to identify exactly where they are heading, but the

overall pattern appears to be similar to as for other passengers.

The situation for UK originating passengers returning to the UK is very different. The ultimate destination of these passengers is much more diffuse. The most significant concentration is on the Euston/Kings Cross/St Pancras complex where passengers can continue their onward journey to other parts of the country. The proposed service from Heathrow to St Pancras will be of great benefit to these passengers and to those heading for hotels in the Camden area. A cross London link is likely to be of little benefit to them.

The only area of London not well served by the Airtrack proposals or the proposed St Pancras link is the City of London and the Eastern part of the conurbation. The cross London link would increase the accessibility to these areas but current demand is relatively small. It may be better to deal with these flows by providing effective interchange if possible, cross platform, between East – West services and Airtrack at Hayes and Harlington.

It is not desirable for passengers waiting for trains on underground station platforms to have to wait for more than the third, or possibly fourth, train before boarding. As we expect a minimum of 24 trains per hour to run through the central tunnels this implies that each destination must be served by at least six and more likely eight trains per hour. Six, eight car trains per hour at Heathrow Central Station would provide capacity in excess of that required for access to areas served by the line.

It is usual to provide a slightly longer dwell time at airport stations than at a normal wayside station. This is because of the number of passengers with luggage, unfamiliarity with the system etc. and we envisage that 14 trains per hour would be an appropriate target. Six trains per hour from the cross London link plus four to St Pancras and four to Paddington would fully use the available capacity leaving no space for development of the long distance services that are desired by BAA.

One of the benefits for the Regional Metro option is the possibility of operating what is in effect a closed

system. This should give a high standard of reliability and performance. If Regional Metro trains are run into Heathrow they will be unable to terminate there. In order to make optimum use of the limited rail facilities at Heathrow, they will need to run through to form part of the Southern part of the Airtrack services. This introduces a high risk of importing 'performance pollution' from the South West network.

The sSRA therefore suggests that it may not be appropriate for trains from the cross London link to be routed through Heathrow. A better solution may be effective cross platform interchange at Hayes and Harlington between Airtrack services and the cross London link. A decision on this should form part of the project definition stage and should be subject to external consultation. Meanwhile the St Pancras link should proceed as quickly as possible followed by the full Airtrack scheme if Terminal 5 goes ahead.

4.3 Freight and orbital routes

4.3.1 Freight development

There are a number of places on the London rail network where freight movements and passenger train movements conflict. These include the section of the Great Eastern line between Forest Gate Junction and Stratford, the North London group of lines, the West London line and parts of the South London network.

The Great Eastern deals with traffic from the Felixstowe direction, the majority of which travels towards London as far as Stratford then turns right, over a flat junction, on to the North London line. Traffic from the Tilbury direction joins the slow (electric) lines of the Great Eastern at Forest Gate Junction to travel towards London. This traffic then crosses all four tracks of the Great Eastern to join the North London line at Stratford.

If the proposals for the passenger network set out in section 4.1 are to be realised then it is essential to remove these conflicts on the Great Eastern. Moreover the other conflicts mentioned above will cause difficulty for some of the rail development schemes currently being progressed but which are outside the

4 The strategic choice (continued)

scope of this study. These include the South London Metro and the initiative for the development of services on the East London, North London and West London lines. The current practice of preventing all freight movement in the peak periods will also present increasing problems as freight traffic, particularly of time sensitive goods, grows.

The upgrading of the Felixstowe to Nuneaton route is supported by the sSRA and the DETR as set out in the 10 Year Transport Plan. Development work for this has already started. It will take a significant amount of traffic off the Great Eastern line. However, there will still be some residual movements on this route and flows from the Tilbury area will be unaffected.

In order to deal with the increase in freight flows and remove conflict it is proposed to develop a long term strategy for a freight focused route to by-pass the 'pinch points'. This strategy is based on an incremental approach with each stage bringing benefits on its own, but all building towards a comprehensive solution. This freight strategy is made up of a series of elements that are set out below.

4.3.2 Upgrade of the Gospel Oak to Barking line - Phase 1

The Gospel Oak to Barking line (Tottenham and Hampstead line) connects directly to the Tilbury Loop and hence to Dagenham, Tilbury and Shellhaven by way of a flyover at Barking. From this flyover North to Forest Gate Junction the line is electrified and carries the existing, fairly heavy, freight flows from the Tilbury Loop heading for Stratford and the North London line. This traffic leaves the Gospel Oak to Barking line near Woodgrange Park Station to join the Great Eastern at Forest Gate Junction.

The Gospel Oak line then passes over the Great Eastern line on viaduct and then through North London to Gospel Oak. There are limited connections with the West Anglia and the Great Northern routes and a short length of electrified line at Tottenham. In general the state of the line between Woodgrange Park and Gospel Oak is only adequate

for the current, very low level of traffic with many restrictions on weight and speed. Current traffic consists of two, all stations, passenger trains in each direction every hour. This line should be upgraded to full functionality including improvement to the signalling. It would then be possible to run some diesel hauled freight trains from Barking and the Tilbury Loop to join the North London line at Gospel Oak.

The cost of this upgrade would be in the region of £25 million. This project should proceed directly to feasibility and design.

The relief provided to the Great Eastern would be immediate but unfortunately not complete. This is because the North London line to the West of Gospel Oak passes through the Hampstead Tunnel. This tunnel has a restricted gauge (W8) and cannot accommodate much of the deep-sea container traffic. This would be addressed by the second stage of the strategy.

4.3.3 Improved links to the West Coast Main line

There are three possible options for relieving the gauge problem in the Hampstead Tunnel area. The most obvious is to enlarge the bore of the existing tunnel. This would be difficult because of the disruption that would be caused to the existing traffic. In the long term simply to enlarge the tunnel may present difficulties for the proposed expansion of passenger services on the North London line.

An alternative to enlarging the tunnel would be to construct an additional bore alongside the existing tunnel. To take full advantage of this would also require extensive works to the section of the North London line between the Western portal of the Hampstead Tunnel and Willesden Junction. The construction cost of the tunnel in this option would be in the region of £130 million. Works to the section from the tunnel to Willesden would double this cost.

A more radical solution would be the construction of a tunnel from a point close to Gospel Oak to link with the West Coast Main line close to its junction with the Primrose Hill branch of the North London

line. This would cost about £150 million, and would negate the need for significant works on the North London line.

The sSRA recommends that a feasibility study of these options be carried out as soon as possible to establish the costs and benefits and to allow the adoption of a strategic direction for this element of the freight focussed route.

4.3.4 Upgrade of the Gospel Oak to Barking line - Phase 2

Although Phase 1 of the upgrade of the Gospel Oak to Barking line mentioned above, would allow freight traffic over the line to be re-instated it would require all trains to be diesel hauled and capacity would still be limited. Once the gauge problem in the Hampstead Tunnel area is eased then it would be worthwhile investing in the route by electrification and resignalling. This would allow all freight from the Tilbury and Dagenham area to use this route. Passengers services would be retained at the current level.

It should be emphasised that if the East – West proposals contained in the passenger section of this study are to be implemented it will be essential to remove all freight joining the Great Eastern from the Barking direction. If these three (4.3.2, 4.3.3 and 4.3.4) proposals are implemented they will provide an effective way of doing this.

The sSRA recommends that Phase 1 of the upgrade of the Gospel Oak to Barking line should make passive provision for electrification and resignalling of the line and therefore a decision on scope of the enhancement is required as soon as possible.

4.3.5 Link from the Great Eastern

Once a freight route has been established over the Gospel Oak line there would be benefit in constructing a single line connection from the Great Eastern onto it at Forest Gate Junction. This would deal with the remaining flows from the Felixstowe direction and take all the remaining freight trains off the section of the Great Eastern between Forest Gate and Stratford.



This connection would cost approximately £25 million. Although not directly required for the East West passenger proposals, it would have the effect of moving almost all freight traffic off the North London line. Gospel Oak to Barking would become a mainly freight railway with occasional passenger trains, leaving the remaining lines in the North London line group to be developed into a mainly passenger railway with occasional freight trains.

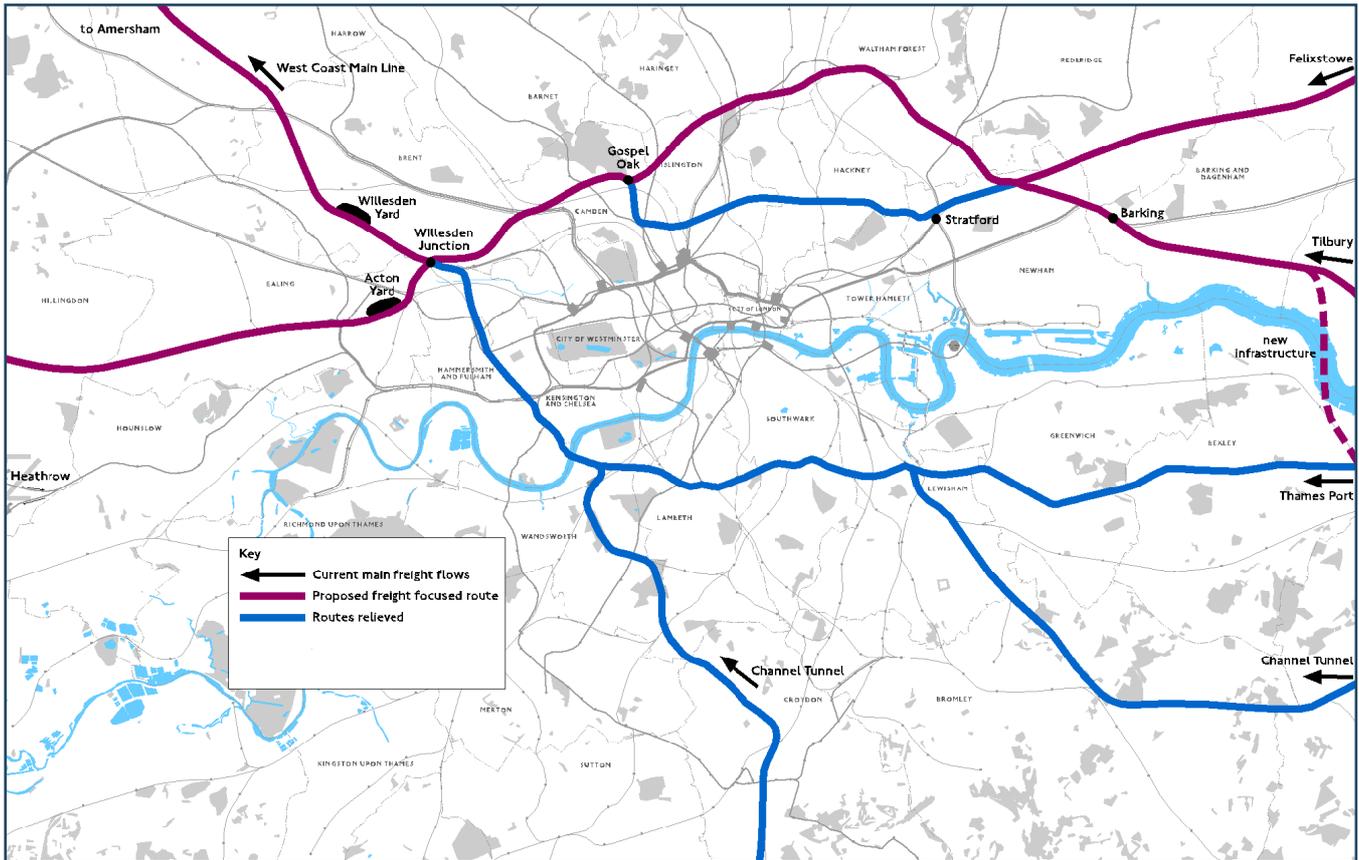
This is a longer term proposal and, although passive provision should be made at this stage, a decision on whether or not to proceed should be deferred pending the development of traffic after the upgrade of the Felixstowe to Nuneaton line is complete.

4.3.6 Thames tunnel and associated works

The completion of a freight focused route round the North East side of London makes a mainly freight link across the Thames to the East extremely attractive. If this is to make use of the route described above the appropriate location would be close to the proposed Channel Tunnel Rail Link tunnel in the Dartford area.

4 The strategic choice (continued)

Freight proposal



Although it may be possible to use the CTRL route for some specialised freight, capacity constraints and gradients would limit this.

A dedicated tunnel route would connect with the North Kent lines giving direct access for freight from the Hoo Junction, Thamesport area. Re-gauging work and a short new chord in the Maidstone area would be required to pick up Channel Tunnel freight.

Although the freight business would benefit from this proposal, particularly due to possible easing of freight restrictions during the peak, the main beneficiaries would be the passenger operations in South London. Relief would be provided to the West London line where the provision of additional orbital passenger services and new stations, aspired to by Transport for London and the Boroughs, is severely limited by the heavy freight occupation.

4.3.7 Programme for the freight focused route

If the programme set out in the previous sections was completed it would lead to the entire London network, with the exception of this freight focused route, handling only freight traffic that has an origin or destination in London. This would release capacity for several of the London passenger proposals including Orbirail (see below).

A plan showing the main elements of the freight proposals is shown above. The overall programme proposed is shown on page 26.

4.3.8 Great Western freight flows

The most significant freight flow not dealt with by the proposals set out above is that along the Great Western Main line. A substantial proportion of this is heavy freight trains carrying aggregate and other building materials. Most of these trains enter Acton

Yard where they are split into smaller units for distribution to their ultimate destination around the South East.

Freight on the Great Western will be increased if the London International Freight Exchange (LIFE) opens at Colnbrook to the West of Heathrow Airport. It is intended that trains will access this facility along the Great Western Main line with some trains running in to Acton Yard to allow them to turn round before moving off to their ultimate destination.

These movements into the Yard present particular problems because they are made at slow speed, causing significant 'block-back' on to the Great Western Relief lines. Freight movements are only one of several problems on the Great Western which taken together with the East West passenger proposals and Airtrack (see below) will require an increase in infrastructure capacity on the Great Western Main line. This would be delivered by increasing from four to six tracks on parts of the line.

4.3.9 Passenger orbital routes

It is intended to extend the East London line of the London Underground to link with the National Rail Network at Dalston in the North and Peckham Rye in the South. This will allow through running of trains from the South London lines to the North London lines.

The sSRA is currently developing a franchise proposal for an operator to run services over these lines together with the West London Line, the Gospel Oak to Barking line and the DC lines between Watford and Euston. This franchise has been given the working title of Orbirail.

All these lines are potentially of great significance for local passengers making, generally, short journeys along the line. In order to be effective in attracting this kind of traffic high frequencies are essential.

At present the North London line and the West London line carry a significant amount of freight and this is forecast to increase. In order to accommodate the desired passenger services and allow headroom for long term growth of freight traffic, significant capital

works will be required. This will include the work described for the freight focussed route and possibly some additional works. The exact details of this can only be resolved as part of the re-franchising process.

4.4 South-West to North-East cross London routes

We recommend that a joint feasibility study between the sSRA and Transport for London of the Wimbledon to Hackney route be taken forward as soon as possible with a view to establishing the optimal route and service pattern. This will allow construction to start as soon as possible after the Paddington to Liverpool Street route. The exact phasing will need to take account of the capacity of the tunnelling and railway equipment industries.

This scheme will provide the following benefits that are in addition to those listed for the East-West scheme:

- provides significant relief of overcrowding on the South West Trains routes and in particular those into Waterloo;
- supports the development of the 'Super Hub' at Kings Cross/St Pancras;
- provides direct access from the South West to the West End;
- supports the regeneration of the Hackney area;
- provides relief of overcrowding on the Victoria line.

The two cross London routes complement Thameslink 2000 and together would provide three new National Rail Network routes across Central London.

5 Funding and delivery

5.1 Overview

This report contains recommendations for several capital schemes to go ahead. They range from the relatively modest scheme to upgrade the Gospel Oak to Barking line up to the very substantial project to construct new networks based on cross London tunnels. The mechanism for funding of these schemes will vary but it is anticipated that a substantial proportion will come directly or indirectly from the public purse and be routed through the SRA. Most of the elements to be constructed in the first 10 years of the programme are already identified as potential schemes in Railtrack's Network Management Statement and have been considered in drawing up the 10 Year Plan. Funding for the major passenger schemes will be required after the period covered by the 10 Year Plan and the source of this will need to be established.

Indicative timescales and costs for the programme are shown on page 26.

Different models of funding will be appropriate for the different proposals. In some cases, for example the upgrade of the Gospel Oak to Barking line, it may be appropriate for the sSRA to make a grant to Railtrack for the purpose of carrying out the work. Another approach would be to use the re-franchising process to route the funds. This may be the appropriate approach for the Great Western six tracking scheme. For the very large schemes, such as new tunnels under London, an approach using an investment vehicle established specifically for that project, might be appropriate. This last option is discussed in more detail below.

No attempt has been made in this report to identify the appropriate funding route for each scheme other than the major tunnel proposals. This is best dealt with as part of the project definition phase for each of the schemes.

5.2 Major passenger schemes

The proposal for the Paddington to Liverpool Street route presents the opportunity to route the investment through a performance-based contract. In this arrangement the infrastructure will be constructed by an entity, known as a Special Purpose Vehicle (SPV), which as a minimum would be responsible for the design and build and possibly for the operation and maintenance of the system, being paid only when the project is complete and operating properly.

There are a number of potential ways in which this could be carried out. This includes options for the SPV to own only the tunnels with Railtrack providing the railway systems inside an empty bore, through to a situation where the SPV owns the tunnels, the rolling stock, and at least some of the route outside the tunnels. In the latter, the SPV would operate and maintain the whole system.

Issues arise as to whether the SPV should be obliged to take revenue risk. This would be difficult for them to do at the very preliminary stage when tenders would be called. It may be better to confine the SPV's risk to those areas that it can control effectively. Establishment of the appropriate mechanism for this should form part of the project definition phase.

There is a significant difference between the Regional Metro and the Regional Express options in terms of the opportunity for ownership and operation. If the Regional Express option is developed many of the trains running through the tunnels will spend a significant part of their running time on Railtrack metals which they will share with other traffic across several franchise boundaries. This would make the option of developing an SPV option to run and operate the total system extremely difficult. Options for the Regional Metro make it possible to conceive a fully segregated system with the SPV taking full responsibility for operation and maintenance of the whole network. Even with this option it would be necessary for Railtrack to be able to use the Metro lines during maintenance or perturbations. Similarly the Metro operator would need to use the Railtrack system when the Metro tracks were being maintained

Alternatively, the design, construction and maintenance of the tunnel could be kept within the public sector with the train operator paying track access charges.

The stations in the central section will have to be under the operational control of London Underground Limited. This is because they will share entrances and other facilities with Underground stations meaning that they must comply with the London Underground safety case. The safety case specifies that the whole complex must be under the operational control of one party.

The sSRA recommends that the optimum structure be defined during the project definition stage.



6

Obtaining powers for the cross London link

The usual procedure for obtaining the necessary powers for the construction of a new railway is via the promotion of an Order under the Transport and Works Act 1992 (TWA). The only alternative approach under the current legislative framework is the promotion of a Hybrid Bill.

The TWA process is still relatively new and there is no precedent for the successful promotion of an Order for a scheme of the size and complexity of those proposed for the main passenger options.

The Transport and Works Order process for a project of this size will dictate that a public inquiry is held. This will be followed by the writing of an Inspector's report and period for Ministerial decision making. It is difficult to make accurate estimates of the length of time these processes will take. The precedents for schemes that have been the subject of similar processes such as highway schemes or other major infrastructure developments are not encouraging.

Under the current legislative framework the only alternative approach to a TWA Order is the promotion of a Hybrid Bill. This is a Bill promoted in Parliament jointly by Government and the scheme promoter.

The most recent precedent for this is the promotion of the Channel Tunnel Rail Act 1996. The relatively fast track promotion achieved with this measure was possible due to the much more streamlined procedure and the clear commitment of the Government to proceed.

If the Paddington to Liverpool Street scheme was taken forward by means of a TWA Order the timescales involved in completing the definition and preliminary feasibility of a scheme, the preparation of a draft order, the public inquiry, ministerial decision, tendering and award of contract followed by a five year construction and commissioning period lead to a programme of 13 years before opening. However it must be recognised that there is a significant risk that this period could be considerably longer.

The obtaining of the necessary powers by way of a Hybrid Bill rather than a TWA Order would offer considerable time savings to the overall programme.

The overall time saving could be more than two years.

The Paddington to Liverpool Street options are similar to the CrossRail proposals that were the subject of an unsuccessful promotion by London Underground and British Rail of a Private Bill in Parliament between 1991 and 1994. Subsequently a TWA Order application was prepared but never submitted. Considerable development work has therefore already been done on these options. This will allow some saving in the time prior to the submission of either a TWA application or a Hybrid Bill over the other major infrastructure options. This has been taken into account in the programme.

The Hybrid Bill route would offer a number of significant advantages:

- Although a Bill will need to be considered separately by both Houses, and the timescale subject to the pressures of Parliamentary business and House timetables, even a slow progression through Parliament would offer major time savings;
- A committee of either House would normally come to fairly rapid decisions on a Bill, which would only then be required to have a third reading debate prior to referral to the other house or for Royal Assent. This would avoid the two to three year delay required in the Public Inquiry route for the production of the Inspector's report and the Secretary of State's decision;
- It would demonstrate Government commitment to the project. This will assist in efforts to secure private funding commitments to the project, by providing the private sector with a greater degree of confidence in the management of the programme risks associated with the authorisation process. This in turn may allow further compression of the timescales through the involvement of the private sector at an earlier stage of the project's development.

Set against these potential advantages there are a number of considerations that must be taken into account in considering the Hybrid Bill procedure:

- A Hybrid Bill could be subject to unrelated political pressures and the timetable and priority of other legislation;

7 Operation and franchising of the cross London link

- Parliamentary Committees are unlikely to have significant prior knowledge of the subject matters and are not necessarily as constrained as to what matters can and cannot properly be considered as would an Inspector. Hence the decisions of a Committee may be less predictable and less bound by precedent than those arising from the Inquiry process.

Indicative programmes for the TWA and the Hybrid Bill alternatives are shown in Appendix 3, figures 1 and 2.

The sSRA recommends that a Hybrid Bill is used to obtain powers for the main passenger schemes.

It will be the quality and quantum of the services provided that will enable modal shift and revenues to be captured and in general terms the Regional Metro operations are likely to be more frequent and more reliable than the Regional Express options.

The options that have a simple arrangement of feeder routes are likely to have the most reliable operation as there is less opportunity for local service disruptions to have a knock on effect through the system.

Wherever possible there should be a clear demarcation between the services using the new tunnel and the services using the existing termini. This will prevent passenger confusion resulting from splitting a service between stations. For example the Paddington to Liverpool Street Regional Metro will have all the Great Eastern inner suburban services running through the new tunnel and departing from a Liverpool Street (low level) station.

Metro timetables assume 8 cars but future commuter growth may require 10 or 12. This would require platform lengthening at some stations. The decision on the optimum length of trains will form part of the project definition stage.

Regional Metro rolling stock will be designed for for very high rates of boarding and alighting. Because of this Regional Metro will have shorter dwell times at tunnel stations than the Regional Express than the n Regional Express thereby improving punctuality and train service capacity.

The sSRA recommends that services linked by the tunnel should have one operator. This will need to be taken into account when franchises in this area are renegotiated.

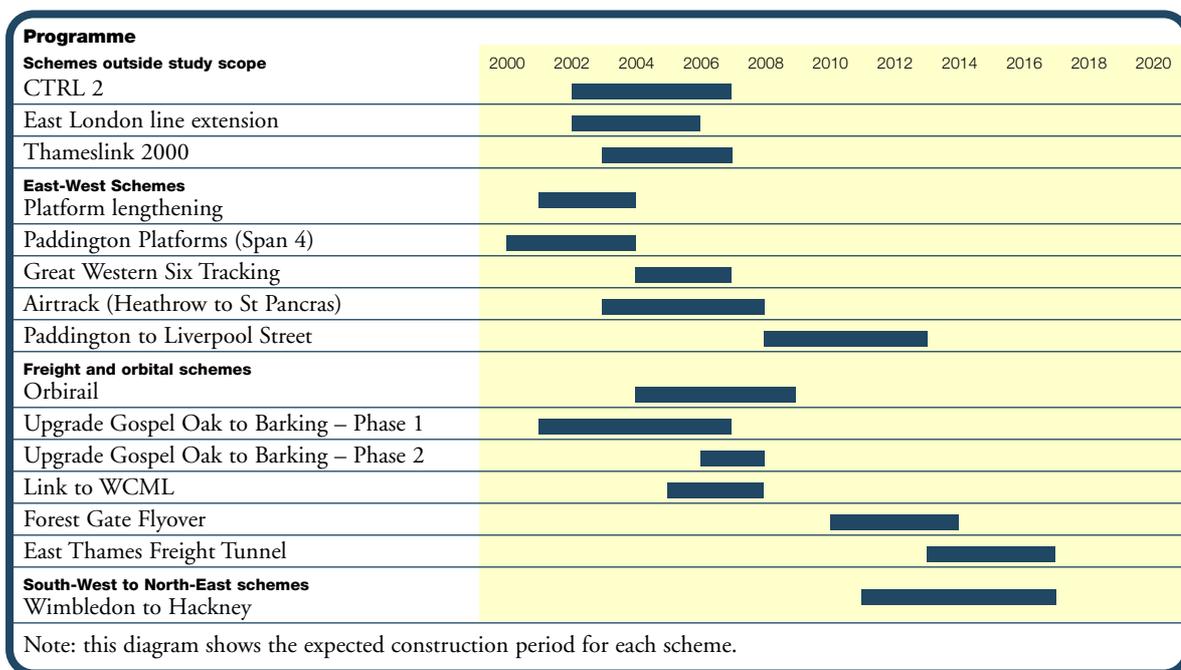
8 Programme

The diagram below shows schematically how the construction activities for the various schemes fit together to form a programme of investment to deliver a world class transport network for London.

The magnitude of the works proposed will require significant resources from the construction industry. It is essential that early discussions with supply side organisations take place to ensure that adequate plans

are formulated for the projects.

We have shown the construction of the Wimbledon to Hackney scheme starting some three years after the start of the Paddington to Liverpool Street scheme. This is after the tunnelling on the Paddington to Liverpool Street route has been completed, as this is seen as a major disruptive activity and also addresses the issue of scarce tunnelling resources.



The sSRA has estimated the costs of the proposed schemes as follows:

High level estimates of the cost of the recommended schemes	Total approximates cost (£ million)
East-West schemes	
Platform lengthening	50
Paddington 'Span 4'	200
Six tracking of the Great Western	550
Airtrack – including Heathrow to St Pancras	350
Paddington to Liverpool Street Regional Metro	2,800 + 600 (Neasden Tunnel)
Freight and orbital schemes	
Orbirail	400
Upgrade of Gospel Oak to Barking - Phase 1	25
Upgrade of Gospel Oak to Barking - Phase 2	110
Link to West Coast Main line	160
Forest Gate Flyover	40
East Thames Freight tunnel	215
South-West to North-East schemes	
Wimbledon to Hackney	5,300

Note: these figures include the cost of the planning, design, obtaining powers (where appropriate), project management and construction.

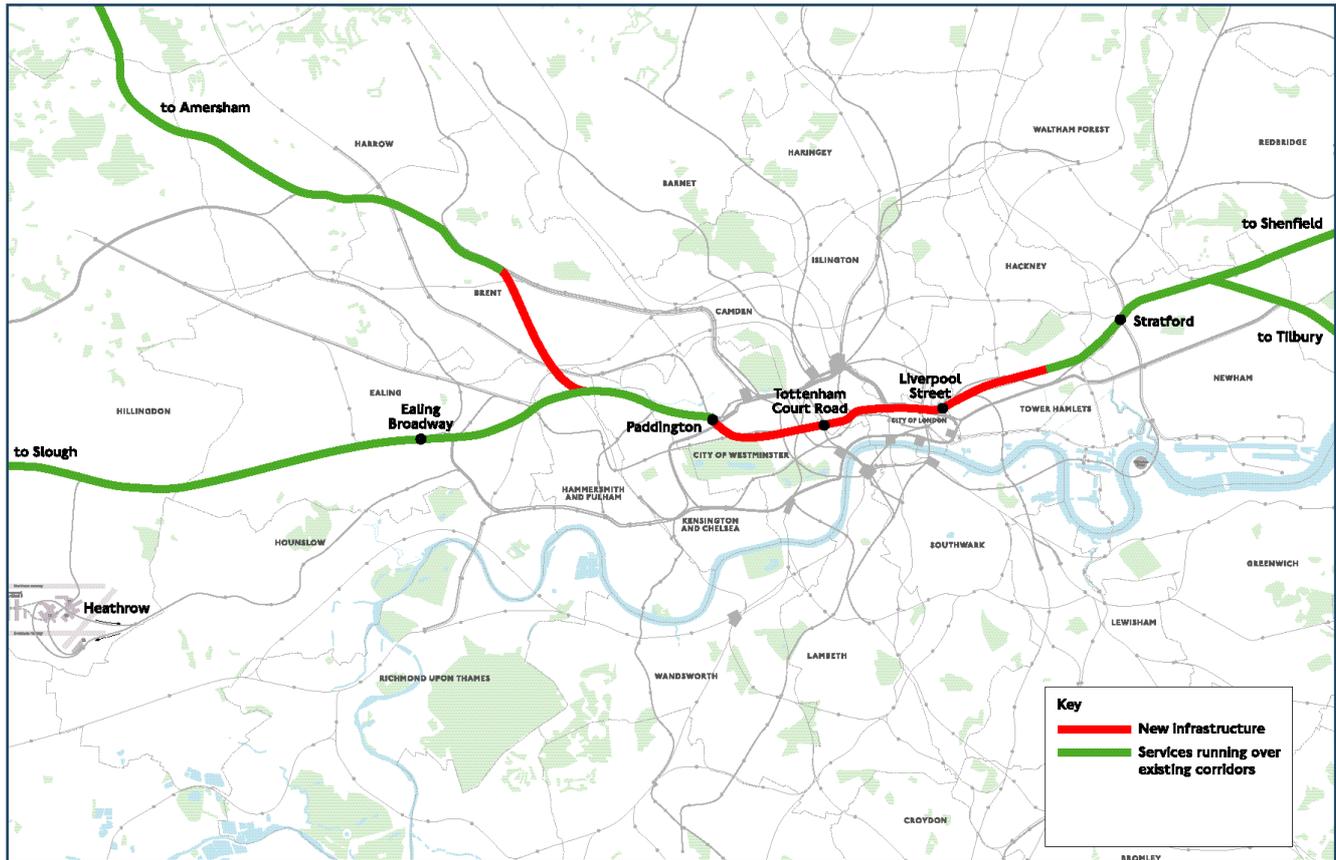
9 The way ahead

The sSRA recommends the following;

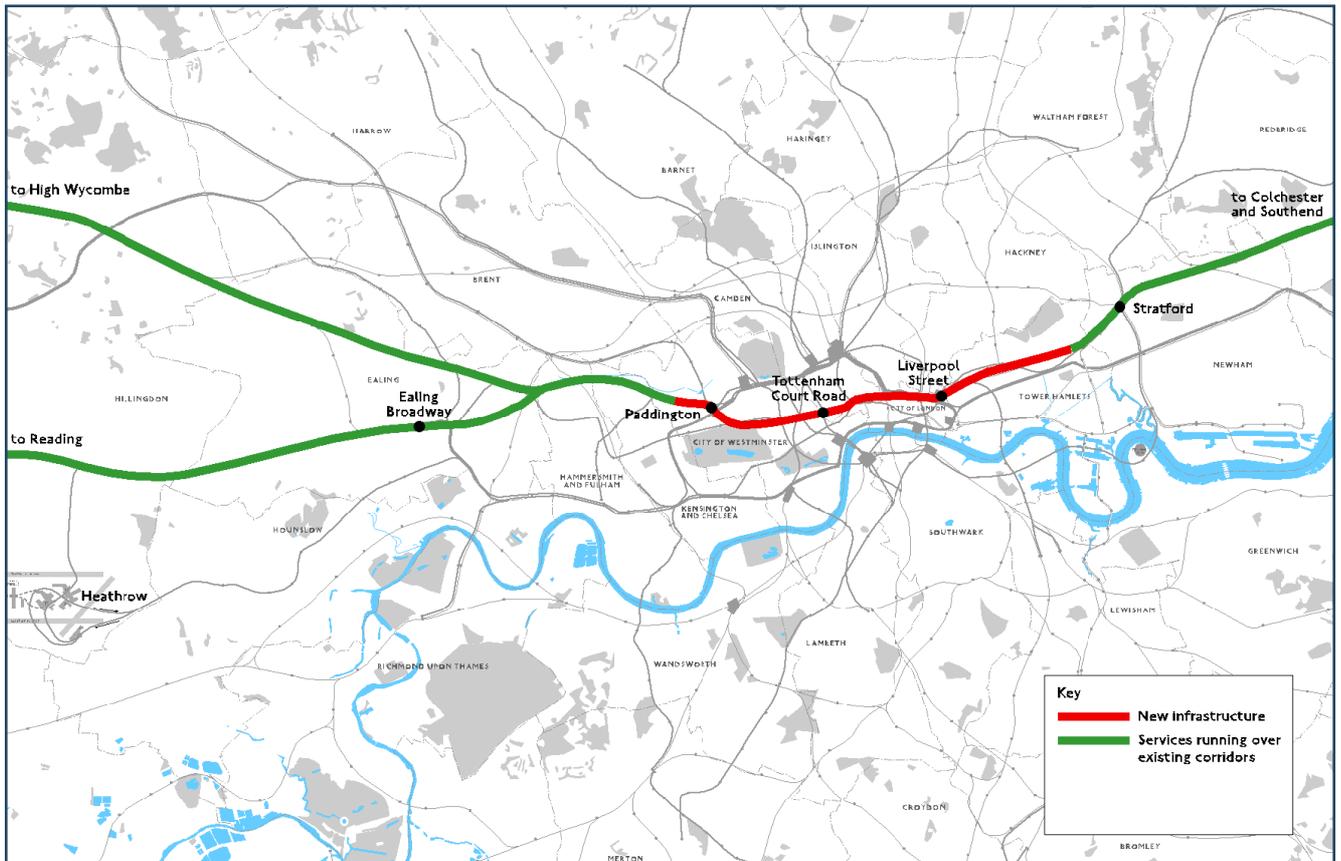
- the Paddington to Liverpool Street Regional Metro scheme progresses to project definition by the sSRA and Transport for London;
- the Paddington to Liverpool Street Regional Metro scheme should obtain powers using a Hybrid Bill in order to reduce the timescales and to increase its attractiveness to private investment;
- The development of options to serve Heathrow Airport by rail should be progressed as quickly as possible. This includes the upgrading of the Great Western Main line to six tracks at least from Acton to Airport Junction;
- The redevelopment of Paddington station including the lengthening of the present short platforms should be progressed;
- The Gospel Oak to Barking line should be upgraded as the foundation of a freight focused route around London;
- The Orbirail proposal to be taken forward as part of the refranchising process;
- The Wimbledon to Hackney scheme is subject to a feasibility study and is taken forward jointly between the sSRA and Transport for London;
- The sSRA and Transport for London team establish a Programme Office to develop, oversee and provide a cohesive direction to the implementation of the programme. Railtrack and London Underground should support this team and act as delivery agents for elements of the programme.
- The sSRA and Transport for London develop the replacement to Railplan and Planet that will provide a consistent tool for modelling journeys in the South East.

10 Route options

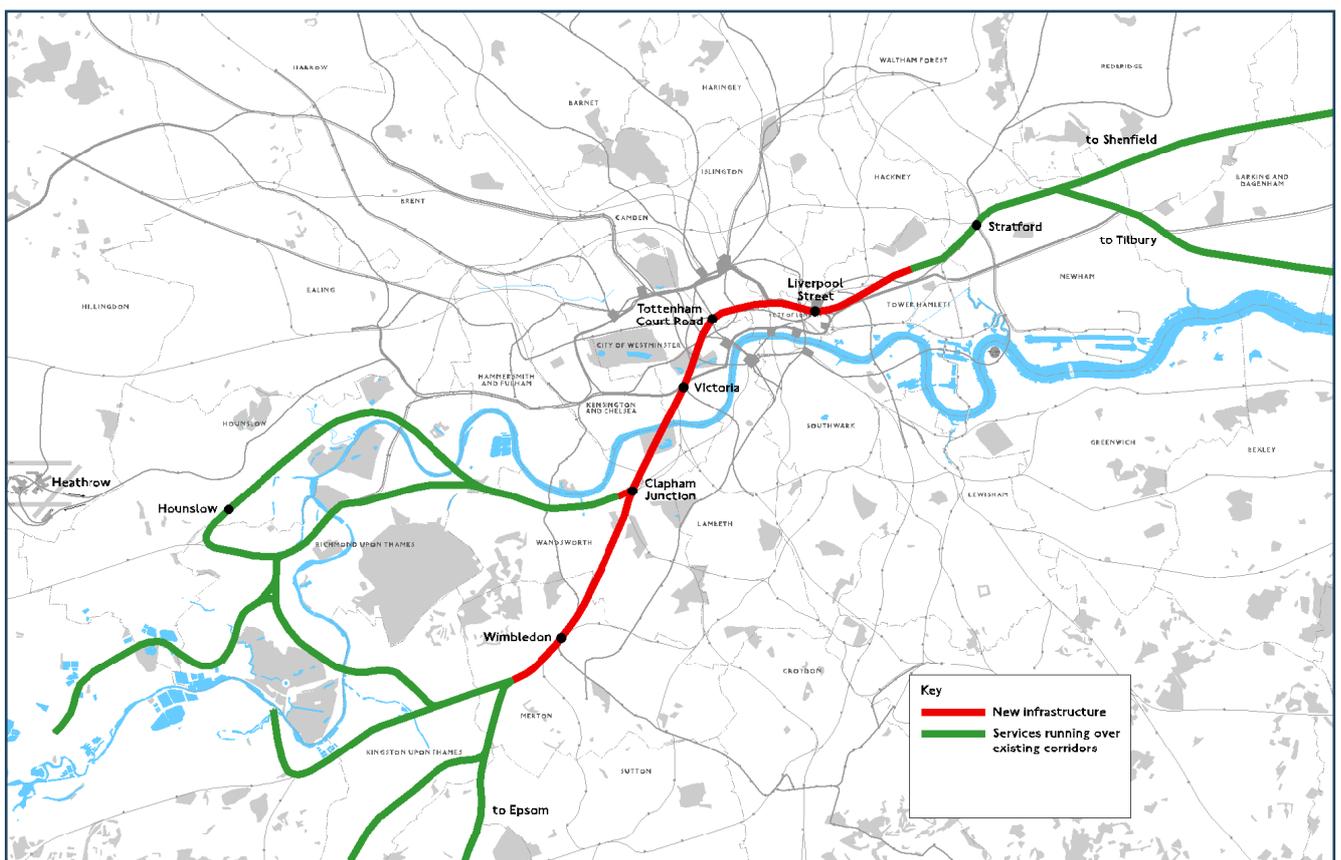
Option 1: Paddington to Liverpool Street - Regional Metro



Option 2: Paddington to Liverpool Street – Regional Express

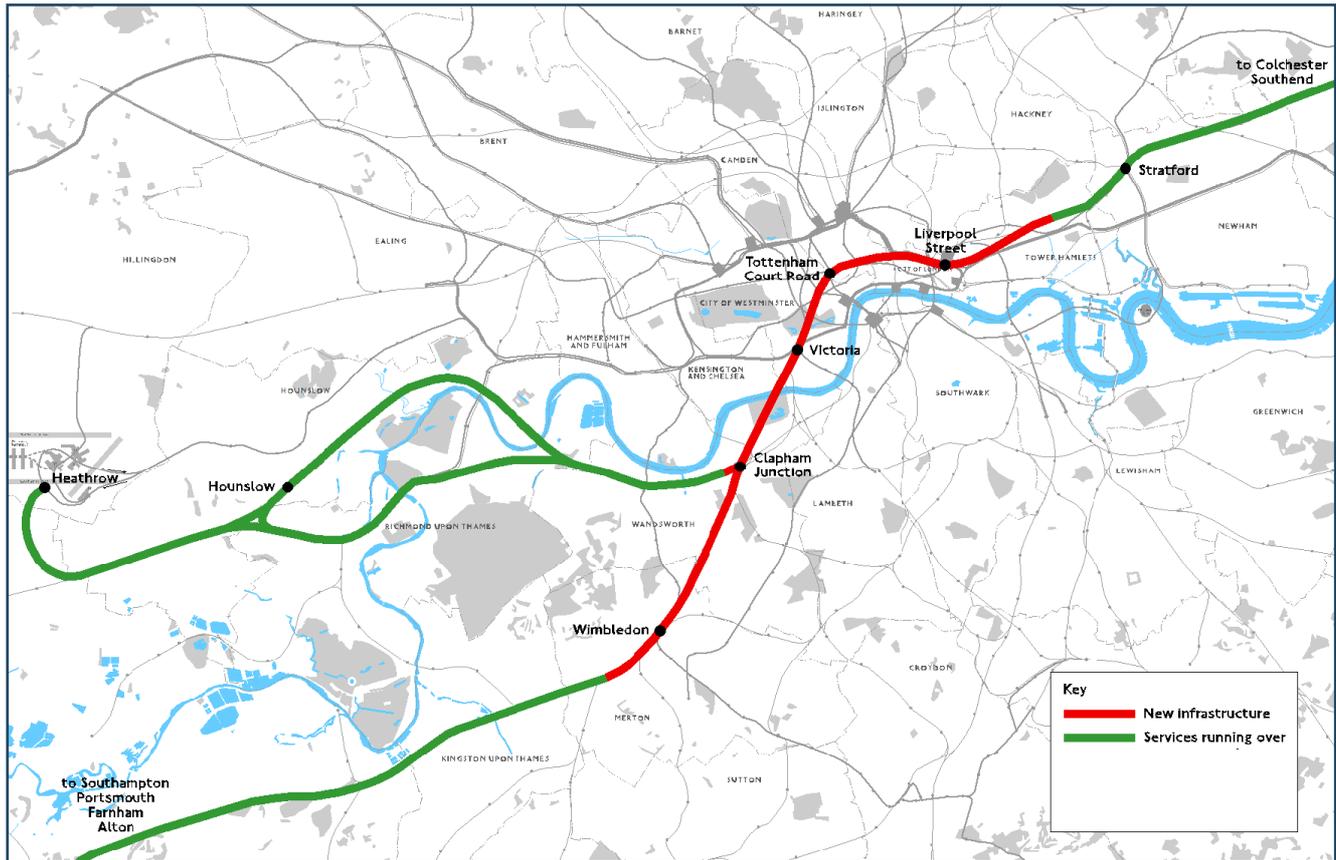


Option 3: Wimbledon to Liverpool Street – Regional Metro

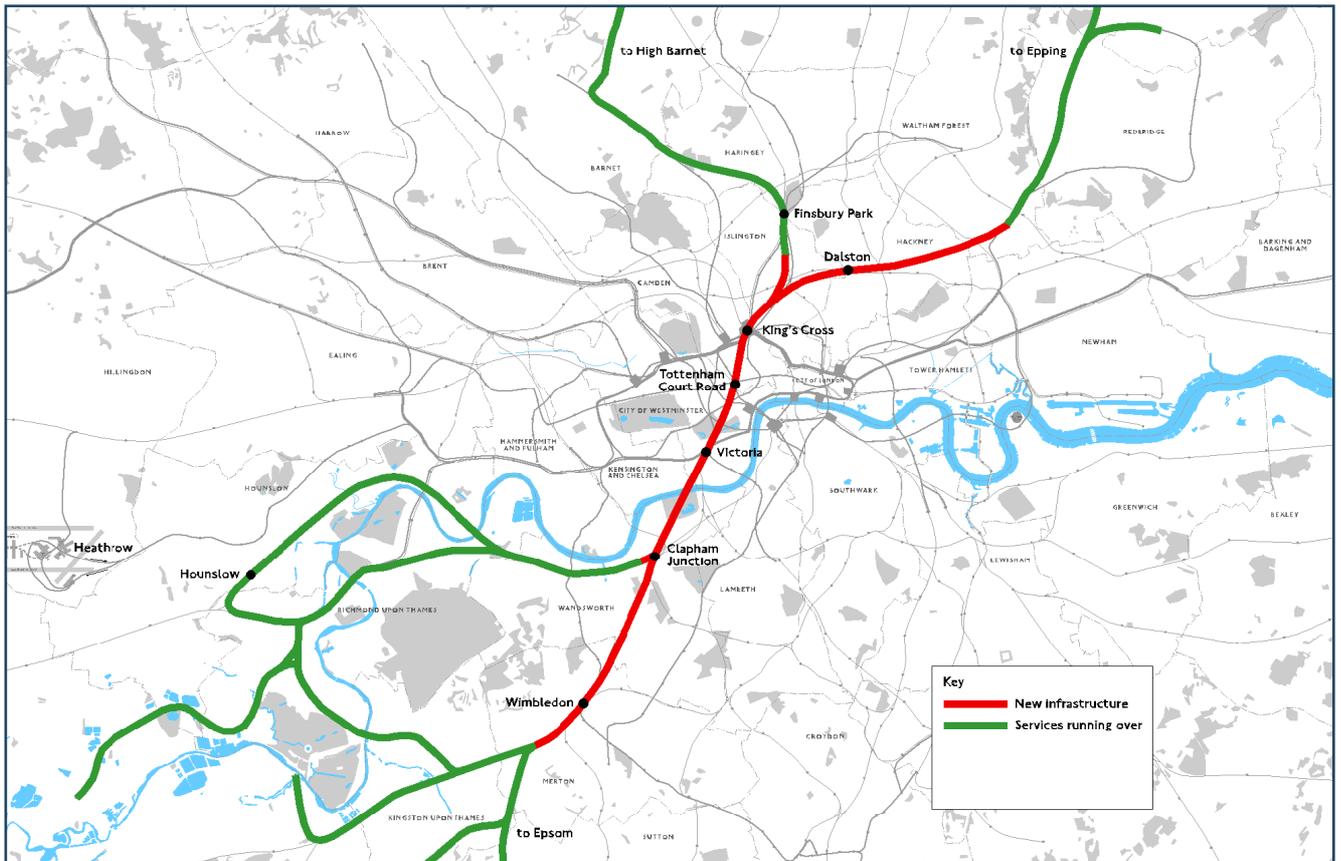


10 Route options (continued)

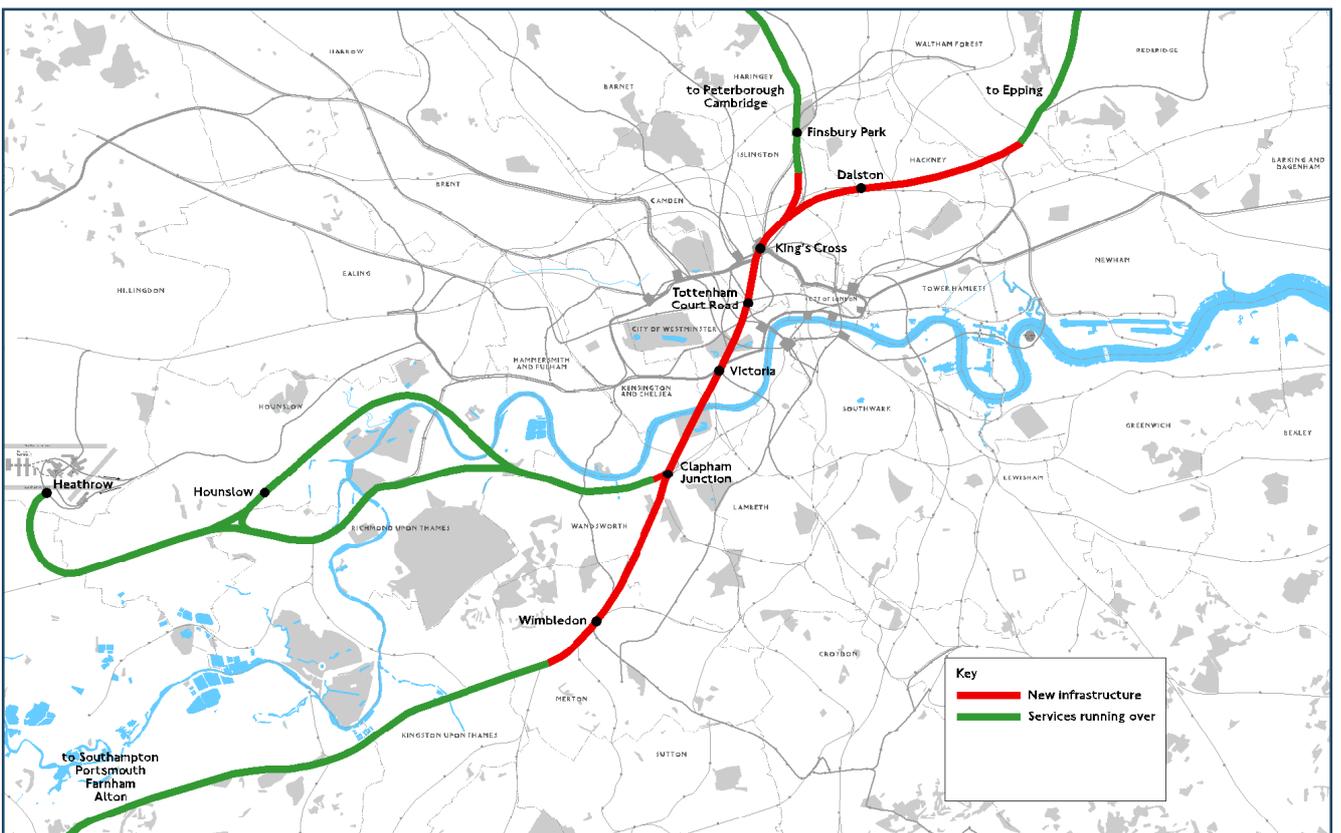
Option 4: Wimbledon to Liverpool Street - Regional Express



Option 5: Wimbledon to Hackney – Regional Metro



Option 6: Wimbledon to Hackney – Regional Express





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