

# Board



Date: 15 December 2016

Item: Crossrail Services and Transition

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**This paper will be considered in public**

## 1 Executive Summary

<b>Decision required</b>	The Board is asked to note the report.
<b>Previous Consideration</b>	On 30 November 2016, the Programmes and Investment Committee discussed this report.
<b>Sponsoring Director</b>	Contact: Howard Smith, Operations Director, Crossrail, TfL Number: 020 3197 5976 Email: <a href="mailto:howardsmith@tfl.gov.uk">howardsmith@tfl.gov.uk</a>
<b>Information classification</b>	Public.
<b>Summary</b>	
<p>1.1 This paper provides an update on information regarding Crossrail services, including trains and stations.</p> <p>1.2 Crossrail is on course to open, as planned, in stages between May 2017 and December 2019. The paper sets out the stages and the frequency of services. It provides details of the new trains that are in production and of the look, feel and security of Crossrail stations.</p> <p>1.3 TfL continues to work with its co-sponsor, the Department for Transport (DfT), to examine ways to improve and increase services to maximise the benefits of the new railway to Londoners.</p> <p>1.4 The paper also includes information on the plans for the eventual transition of Crossrail into TfL's broader organisation as the project completes and the railway becomes operational as the Elizabeth line. TfL and Crossrail Limited (CRL) have a structured programme designed to support and protect project delivery and identify and mitigate the risks of transition into TfL.</p> <p><b>Programmes and Investment Committee Considerations</b></p> <p>1.5 Members requested regular updates will continue to be provided at Board or Committee level and further detail on the proposed franchising model will be given at an appropriate stage.</p> <p>1.6 Members will be offered the opportunity to visit Bombardier's rolling stock production plant in Derby to see the level of design and accessibility that customers could expect from trains on the future Elizabeth line.</p>	

## **2 Recommendation**

### **2.1 The Board is asked to note the paper.**

## **3 Background**

- 3.1 Crossrail is a new type of railway for TfL and for the UK. Running over 100km from Reading and Heathrow in the West to Shenfield and Abbey Wood in the East, it combines extensive operation on existing suburban routes with high frequency 24 trains per hour 'Tube' style operation through the 21km of central tunnels (maps of the route and proposed service frequencies are included in Appendix 1). The closest comparators are the 'RER' lines in Paris and 'S-Bahn' services in major German cities.
- 3.2 Crossrail uses a mixture of national rail and Tube technology. Trains are full national rail loading gauge, 200m long and will operate at speeds of up to 140kph (90mph). In the central section the trains will use a Tube style Communications Based Train Control (CBTC) signalling system and the stations will be similar to modern Underground stations with platform edge doors.
- 3.3 Construction is being undertaken by CRL, a subsidiary of TfL, sponsored jointly by TfL and the DfT. TfL is responsible for buying the rolling stock for the new railway. Once completed, responsibility for the infrastructure will be passed to TfL for operation and maintenance.
- 3.4 The Crossrail Act 2009 provided the necessary powers to deliver the scheme and construction started in 2009. Overall, construction is now approaching 80 per cent complete, with the running tunnels finished, track laying and station fit out underway and work now commenced on the installation of the power and signalling systems.
- 3.5 Unlike TfL's other railway services, Crossrail is subject to regulation under the Railways Act 2005 and is being constructed in accordance with common European technical standards, which apply to new mainline rail construction in the UK.
- 3.6 Day to day operation of train services is the responsibility of the operator, MTR Crossrail, which was granted an eight year concession (with a possible two year extension), which commenced in May 2015.
- 3.7 In February 2016, it was announced that the railway will be known as the Elizabeth line from December 2018. For clarity, the phrase Crossrail is used throughout this paper to refer to both the project and train services.

## **4 Phased Opening of Crossrail**

- 4.1 The opening of Crossrail will take place in a number of stages. The staged approach is designed to allow the various parts of the railway to be brought into service and demonstrate reliable operation before the trains and operations, on both surface sections and in tunnels, are all brought together in 2019.

- 4.2 The first phase of bringing Crossrail into service started in May 2015, when TfL took over responsibility for the provision of the stopping services, trains and intermediate stations between Liverpool Street and Shenfield. These are operated by MTR Rail as 'TfL Rail' using existing network rail infrastructure and the 35 year old trains previously in use on the line.
- 4.3 The reliability of the line has improved since responsibility transferred to TfL, with the Public Performance Measure (PPM) increasing to 94.2 per cent (a reduction of just under a third in delays). From the day when TfL took over, all stations have been staffed from start to close of service, trains and stations have been deep cleaned and repaired, additional British Transport Police resources deployed and the TfL fares structure introduced with some significant reductions in fares for certain journeys.
- 4.4 The next phase of service introduction (Stage 1 of the formal Crossrail Project opening phases) is the introduction of the first of the new Class 345 trains to run between Liverpool Street and Shenfield from May 2017. Over the course of 2017 the majority of services on TfL Rail will move to being operated by new trains, although some of the older trains will remain in service through to full service in 2019. Details of the new trains are included in section 6, below.
- 4.5 Stage 2 of phased opening sees Crossrail operate four trains per hour between Paddington and Heathrow using existing tracks. This will start in May 2018 and these services will replace the current two trains per hour Heathrow Connect trains, operating to Terminals 2/3 and Terminal 4. Heathrow Express services continue to operate to Terminals 2/3 and 5 and do not change as a result of Crossrail.
- 4.6 In December 2018, (Stage 3) services will commence in the Crossrail central tunnel, operating up to 15 trains per hour between Paddington (new below ground Crossrail platforms) and Abbey Wood, via the West End, City and Canary Wharf. Services on the existing railway between Shenfield and Liverpool Street and Paddington and Heathrow continue to operate separately. From this date Crossrail services will be referred to as the Elizabeth line.
- 4.7 In May 2019, Shenfield to Liverpool Street services will be connected into the central tunnel section to run as far as Paddington. The timetable between Shenfield and Liverpool Street will be revised to give a minimum of 12 trains per hour at all stations in the peaks and, combined with 12 trains per hour to/from Abbey Wood, the central section will move up to a 24 trains per hour service. Services between Paddington and Heathrow will continue to operate separately.
- 4.8 Finally, in December 2019 services from the West will be connected into the central tunnel and Crossrail trains will be extended in the West to Maidenhead and Reading. This is the final phase (Stage 5) of Crossrail service introduction.

## **5 Crossrail Service Frequencies and Patterns**

- 5.1 Once services are fully open, the central section will have a 24 trains per hour service in the peak. In the East, trains will split evenly with 12 trains per hour serving Stratford and all stations on the Shenfield Line and 12 trains per hour heading South East through Canary Wharf to Custom House, Woolwich and

Abbey Wood. In the West, the current plan has 10 trains per hour West of Paddington in the peak, four trains to Heathrow (Terminals 2/3 and 4), and two trains per hour to each of West Drayton, Maidenhead and Reading.

- 5.2 Off peak services will be 16 trains per hour in the central section, with eight trains per hour to each of Shenfield and Abbey Wood and eight trains per hour in the East. To the West, four trains per hour will run to Heathrow, two to Maidenhead and two to Reading. In the West some trains do not call at all stations, so while busier stations receive up to 10 trains per hour, smaller stations generally have a minimum of four trains per hour.
- 5.3 Services will operate broadly the same hours of operation as Underground services, with first trains arriving at Tottenham Court Road station around 05.30 and the last trains departing at 00.30. Consideration is being given to future night services. These would follow full service introduction and would require significant changes to maintenance practices on the surface sections of the route, where Network Rail practice is to undertake major maintenance work overnight at weekends.
- 5.4 TfL is working with the DfT to examine the case for higher frequencies off peak, more Crossrail services to Reading and the possibility of Crossrail serving Heathrow Terminal 5.

## **6 Class 345 Trains**

- 6.1 To operate Crossrail services, TfL is procuring 66 new Class 345 trains from Bombardier (photographs of examples of these trains are included in Appendix 1). These will be introduced in stages (as above) starting in May 2017. Initially, new trains running between Shenfield and Liverpool Street will be 160m long. All subsequent deliveries will be of 200m long trains and the reduced length (160m) units will be lengthened to 200m in 2019, once platforms at Liverpool Street have been changed to accommodate them. Passive provision has been made in train and station design for future lengthening of the trains to 240m (an extra two carriages).
- 6.2 The trains will be over 50 per cent longer than existing underground trains and will include full air conditioning, walk through carriages, a mix of longitudinal and bay seating and four dedicated spaces for wheelchairs. They will have CCTV, public address systems and modern (LCD) customer information displays offering real time updates on other TfL services.
- 6.3 Assistance with the train design was provided by Barber and Osgerby (responsible for the 2012 Olympic Torches) and the interior has been designed to provide a calm and uncluttered ambience with large windows and high quality detailing using materials such as stainless steel (example images are included in Appendix 1).
- 6.4 The main maintenance depot for Crossrail trains is at Old Oak Common in the West, and subsidiary facilities at Ilford, Gidea Park, Maidenhead and Plumstead, will be used for stabling trains overnight.

## **7 Stations**

- 7.1 Crossrail will serve 40 stations, of which ten are new stations or major new additions to existing stations and the remainder existing national rail stations on the surface sections of the railway. All stations will be step free from street to platform and the ten central section and the Heathrow stations will have level boarding.
- 7.2 Stations in the central section (except for Abbey Wood and Custom House) will be underground. The new platforms are 200m long (with provision for future fit out to 240m) and are fitted with platform edge doors. Most of the central stations have two exits (one at either end) which serve entrances some distance apart at street level, and/or two different underground stations. Platforms will have a common feel to them with cladding and extensive wayfinding information, including 'legible London' mapping at platform level, directing passengers to the correct exit.
- 7.3 Passenger information on next trains and associated information will be displayed above the doors. Electronic advertising panels have been incorporated into the platform screens.
- 7.4 The remaining 30 stations which Crossrail will serve range from major termini such as Reading, through stations which will be substantially rebuilt (including Ilford, Ealing Broadway, Southall, Hayes and Harlington) and smaller stations (Iver, Taplow) where relatively little work is planned.
- 7.5 Where necessary, platforms are being extended and all surface stations will benefit from new customer information screens and long line public address. All surface stations will have toilet facilities.
- 7.6 The Crossrail Act 2009 did not require step free access at seven smaller stations. In 2014, TfL and DfT committed to filling this gap and works are now underway, delivered by TfL, to provide step free access at these seven stations. In addition, a number of smaller stations were planned to receive very little by way of improvements to passenger ambience and facilities so the TfL work (On Network Stations Improvement Project, or 'ONSIP') includes works to ticket halls, waiting areas and platforms that will provide a uniform and acceptable standard throughout the line, equivalent, at least, to the levels of station condition and facilities on the London Overground network. This work will be completed in 2018.

## **8 Customer Experience**

- 8.1 In line with TfL's long standing policy, all Crossrail stations will be staffed from the start to the close of services. In addition, around 450 drivers will be required to operate Crossrail services. So far over 100 have been recruited and are in, or have completed, training.
- 8.2 As well as staffing of stations, Crossrail stations and services will be patrolled by the British Transport Police and will have full CCTV coverage.
- 8.3 It is intended that Crossrail stations and trains will provide both 4G and Wi-Fi coverage. Supporting infrastructure is being built into both the trains and the

stations and tunnels and TfL will shortly seek to contract with Mobile Network Operators (MNOs) for service provision.

- 8.4 Crossrail is intended to represent the highest quality in design of the new stations and trains but also present a coherent overall identity, fully integrated with the wider TfL network. Design guideline documents have been produced for central and surface stations, the trains and also the urban realm works taking place around many of the stations entrances, both on the central area and on the surface sections to the West and East. Each of the central stations booking halls and public areas has distinctive styling linking it to its local area (for instance a diamond at Farringdon, theatre lights at Tottenham Court Road, pinstripes at Liverpool Street).
- 8.5 In addition, an Art Programme is being promoted by the Crossrail Art Foundation, supported by the City of London Corporation and private sector sponsors. This covers seven stations in the central section.
- 8.6 As a major new addition to TfL's estate, Crossrail is included within the TfL wide advertising and property contracts. Provision has been made for digital advertising at platform, escalator and concourse level as well as retailing.

## **9 Crossrail – Transition and Integration**

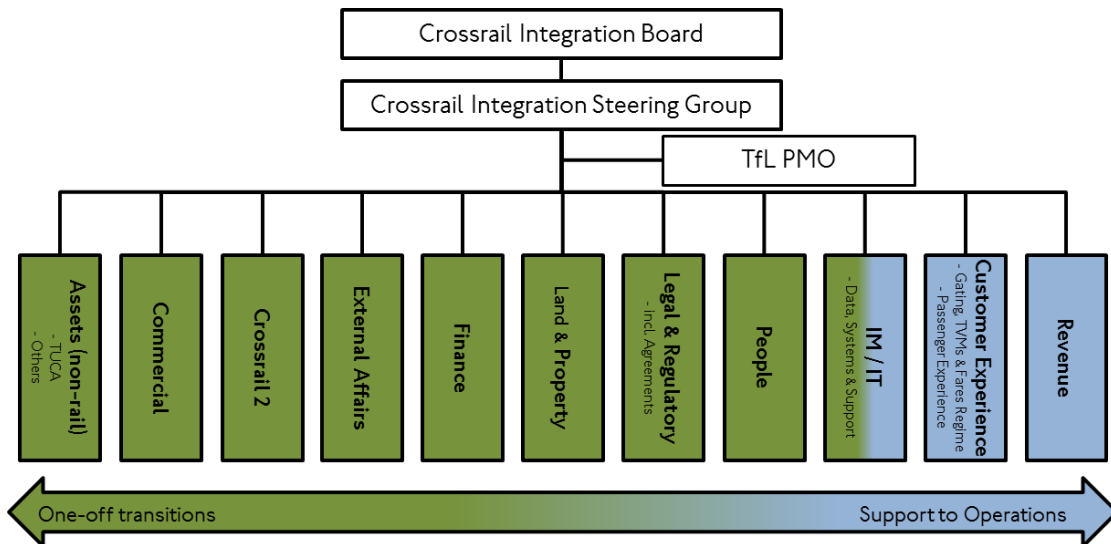
- 9.1 As the project moves towards its operational phase, arrangements are already being put in place to manage the transition of responsibilities from CRL to TfL.
- 9.2 CRL is charged with delivering the end-to-end railway, including necessary alterations to the existing rail network owned by Network Rail, through to final completion, and will hand over elements of the new infrastructure to TfL in the summer of 2018, in advance of the start of services in the central tunnel in December 2018.
- 9.3 After handover of the tunnel infrastructure CRL retains responsibilities for the commercial and technical close out of the construction contracts and for delivery of Stages 4 and 5 of the Project, the stages at which trains running on the existing railway East and West of London are connected into the central tunnel.
- 9.4 For legal and accounting reasons Crossrail Limited will continue to exist as a subsidiary of TfL but, from 2019/20, virtually all of its functions will have ceased or transitioned to business as usual within TfL.
- 9.5 As part of annual Business Planning, CRL continues to plan for the transition in terms of costs and staff numbers required for each of its activities while ensuring that it remains focused on the key challenges ahead.

## **10 The Crossrail Transition and Integration Programme**

- 10.1 To ensure that the transition of Crossrail into TfL proceeds in a structured way with systematic identification and mitigation of risk, a Transition and Integration Programme has been established. The aims of this programme are to:

- (a) ensure the project is supported, protected, closed and integrated successfully; and
- (b) transfer talent, knowledge and processes for the benefit of TfL and Crossrail 2.

10.2 The programme consists of a number of workstreams, focused on the key areas of transition from CRL to TfL.



10.3 The programme is resourced by TfL’s Programme Management Office and is managed by a Steering Group of senior TfL and CRL managers, covering the various workstreams. It reports to the Crossrail Integration Board, which comprises the Managing Directors LU, Finance and HR and the Chief Executive of CRL.

10.4 Whilst the programme will continue through to 2018/19 a number of activities have already taken place as part of transition.

10.5 Crossrail Procurement and Internal Audit staff have transferred to TfL, ensuring that expertise from Crossrail continues to be retained and available to both TfL and CRL.

10.6 Responsibility for operation of the Tunnelling and Underground Construction Academy (TUCA) at Ilford, where more than 16,000 Crossrail contractors and apprentices have received training, will transfer to TfL in January 2017 and will be continued for the use and benefit of TfL including other projects such as the Thames Tideway Tunnel.

10.7 The programme identifies CRL staff about to finish work on the project and assesses their interest and suitability for work within TfL, especially in major projects and Crossrail 2, where the skills match is likely to be closest. In connection with this, the Commissioner is hosting an event at the TfL Victoria Station Upgrade Project on 30 November 2016.

10.8 The need for continued IT support to CRL as its responsibilities decrease is being scoped, so that, at the point where it becomes more practical and more cost

effective, activities and support can be efficiently delivered as part of the wider TfL structure.

- 10.9 Separate to Transition, CRL has established a Learning Legacy activity where lessons from the project are systematically recorded and made available via the internet. As CRL demobilises this will transition to TfL or an agreed industry-wide platform which will continue to make the learning available. Since 26 February 2016, there have been almost 35,000 visits to the CRL Learning Legacy website and over 147,900 page views.
- 10.10 Led by the Crossrail Joint Sponsor Team, a further review has been undertaken of Crossrail Revenue Forecasts. Due to the significance of Crossrail, in terms of revenues, to the overall TfL Business Plan, this is an area that is kept under regular review.

## **11 Views of the Programmes and Investment Committee**

- 11.1 The Programmes and Investment Committee considered and noted this update at its meeting on 30 November 2016.
- 11.2 The Committee noted the complexity of the engineering feat and the similar scale of logistical challenge involved in successfully transitioning Crossrail across into TfL. Members welcomed the focus that had been placed on ensuring that key skills and knowledge were not lost during the transitional period, noting that other large projects such as High Speed 2 and Crossrail 2 remained on the horizon. Members agreed that regular updates should continue at Board or Committee level and requested that further detail on the proposed operating model should be given at an appropriate stage.
- 11.3 It was also agreed that Members would be offered the opportunity to visit the Bombardier rolling stock production plant in Derby to see the level of design and accessibility that customers could expect from trains on the future Elizabeth line.

## **12 Conclusion**

- 12.1 Crossrail is on course to open, as planned, in stages between May 2017 and December 2019. Trains are in production and the detailed timetable is being developed. TfL continues to work with its co-sponsor, DfT, to examine ways to improve and increase services to maximise the benefits of the new railway to Londoners.
- 12.2 TfL and CRL have a structured programme designed to support and protect CRL project delivery and identify and mitigate the risks of transition into TfL.

### **List of appendices to this report:**

Appendix 1: Supporting maps and images

### **List of Background Papers:**

None



# Appendix 1: Supporting Information

Howard Smith

Operations Director – Crossrail

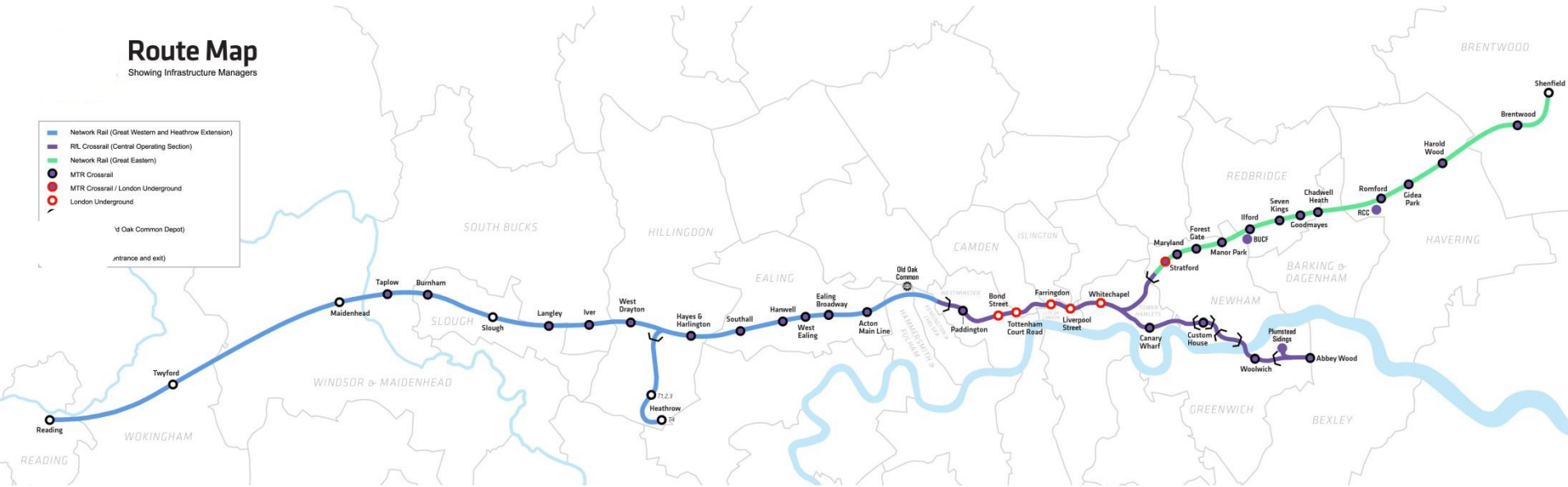


# Geographical Route Map

## Route Map

Showing Infrastructure Managers

- Network Rail (Great Western and Heathrow Extension)
  - RTL Crossrail (Central Operating Section)
  - Network Rail (Great Eastern)
  - MTR Crossrail
  - MTR Crossrail / London Underground
  - London Underground
- Oak Common Depot  
○ entrance and exit



EVERY JOURNEY MATTERS

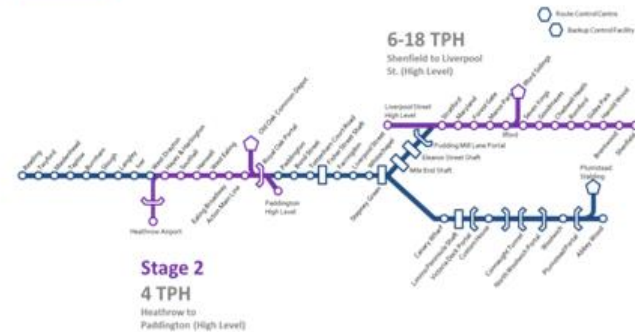
# Staged opening diagrams

2017 Q2 Stage 1



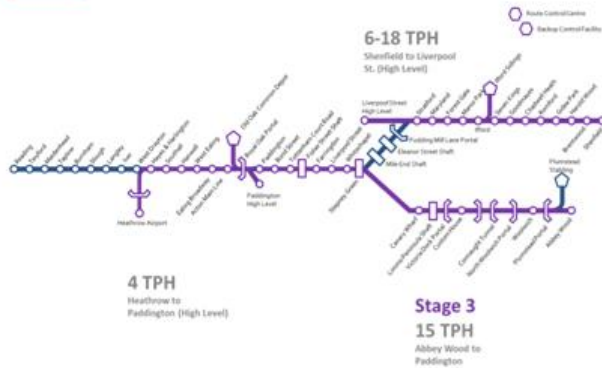
New Rolling Stock on Great Eastern surface section

2018 Q2 Stage 2



New Rolling Stock on Great Western surface section to Heathrow

2018 Q4 Stage 3



Trains run through central section:  
Paddington to Abbey Wood

2019 Q2 Stage 4



Central Section service connected to  
Great Eastern surface section

2019 Q4 Stage 5

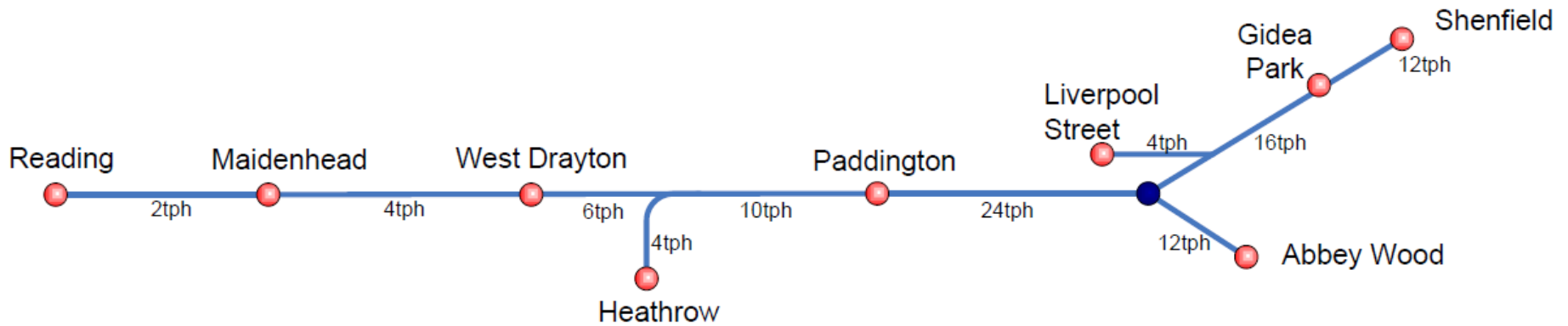


Central Section service connected to Great Western surface section.  
Passenger services operational from Maidenhead and Heathrow to Shenfield and Abbey Wood



EVERY JOURNEY MATTERS

# Service Frequency at Full Opening - December 2019





Train on Old Dalby test track

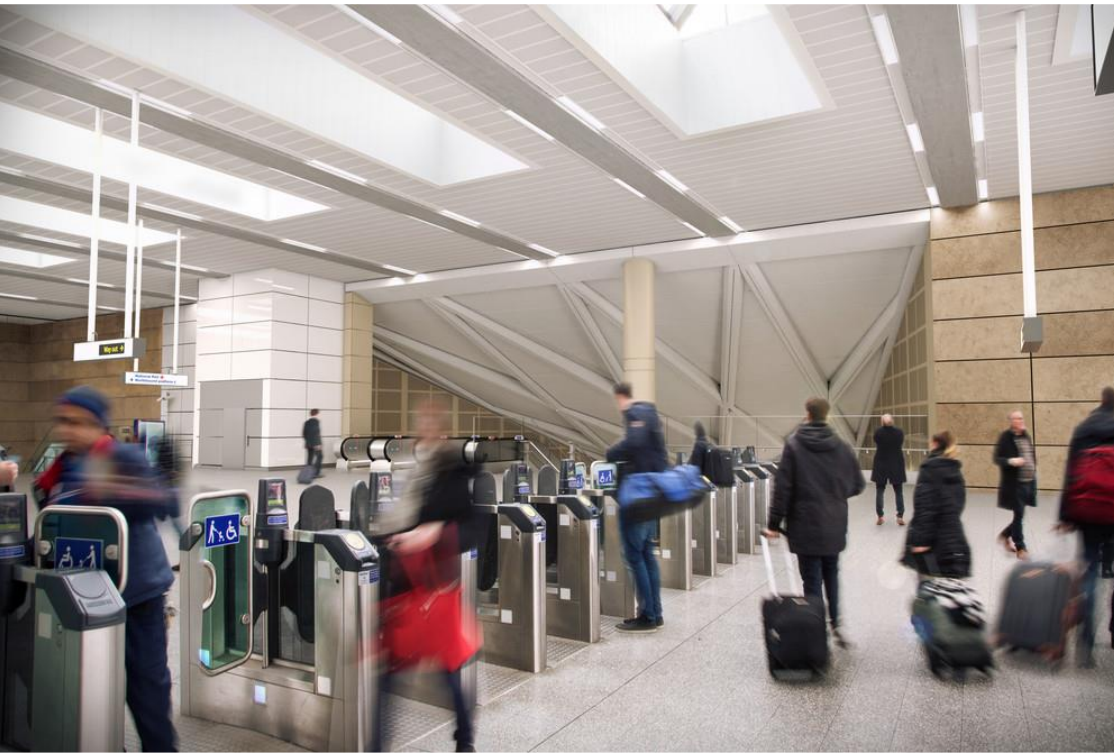
Train in Derby “V Shop”



# Interior of Class 345 train



EVERY JOURNEY MATTERS



Farringdon station gate line

Paddington station platform and screen doors



# TfL Rail/Elizabeth line Staff Training

