

TRANSPORT FOR LONDON

BRIEFING NOTE

Subject: Weekly Mayoral update on Crossrail / Elizabeth line

Date: 9 April 2018

Manifesto commitment(s)

Not applicable

Draft Mayor's Transport Strategy (MTS)

A good public transport experience

Proposal 57: The Mayor, through TfL, will work with the DfT to open the Elizabeth line in 2019, with services initially providing 24 trains per hour through central London and increasing in frequency during the 2020s as demand requires.

1 Purpose

- 1.1 Weekly update to the Mayor outlining progress and challenges ahead of the launch of the Elizabeth line.
- 1.2 The Mayor is asked to **NOTE** this briefing.

2 Headlines

- 2.1 Crossrail's safety performance continues to be strong. At year end, Crossrail's major incident rate (RIDDOR) was 0.08 against an annual target of 0.15. Two sites (Woolwich and Bond Street station) have both worked over 2million hours without a lost time case.
- 2.2 Testing of the new trains and infrastructure has continued between Abbey Wood and Stepney Green during day time hours in "protected manual mode" - driving the train manually but with the train communicating with the signalling system which tells the driver how far and fast it can be driven.
- 2.3 Updated software has been loaded onto the test train, enabling testing using Communications Based Train Control (CBTC - the signalling system for the central section) and further tests such as higher speed and stopping accuracy are contained in the dynamic testing plan.
- 2.4 Train testing in the eastern tunnels (between Abbey Wood and Stepney Green) under signalling protection is due to commence this week and will enable testing at higher speeds as well as testing the stopping accuracy, particularly in relation to the platform screen doors.
- 2.5 Station and tunnel fit-out continued during the Easter period. All platform screen doors are due to be installed by the end of this week. The installation of lifts and escalators across the network is over 80 per cent commenced across all central stations.
- 2.6 Good progress has also been made with the installation of mechanical and electrical equipment and overhead line equipment in the western section (between Paddington



and Whitechapel) of the tunnels. In addition, preparation for energisation of the auto transformer feeder station (which feeds electricity from the national grid) at Westbourne Park is progressing well and the schedule is currently on track to enable a period of short circuit testing and then dynamic testing in the western section in June.

- 2.7 Crossrail's delivery schedule Master Operating Handover Schedule (MOSH) 18 remains on target to deliver the Elizabeth line in December 2018, however there are some challenges which are being worked through. These include the programme and productivity levels being achieved by the main systemwide contractors, Alstom, TSO, Costain (ATCjv), and there has been a delay in the provision of permanent high voltage (non-traction) power to Crossrail's stations, shafts and portals. Testing of station systems will continue to take place using temporary power supplies but final testing before Elizabeth line opening requires testing of systems using permanent power supplies. CRL is currently working to mitigate the impact of the delay.

3 Costs

- 3.1 CRL's costs are reported on a periodic basis and have increased by £3m in the last period to £12,467m.
- 3.2 Discussions took place between CRL and Sponsors (DfT and TfL) at the Crossrail Sponsor Board on 22 March, regarding the likelihood of additional funding being required to complete the project. CRL's official current forecast shows £45m headroom to the limit of the £600m contingency, funded by TfL.
- 3.3 Crossrail's cost forecast is very likely to breach the funding limit by the time of the next formal report (May) as they incorporate the implications of the revised Master Operating Handover Schedule (MOHS), delays to energisation, current levels of productivity on the systemwide and stations contracts, and delays to the development of the train software.
- 3.4 The Sponsors have commissioned a 'deep dive' into some of the critical contracts (including systemwide) to assess the confidence of the cost scenario ranges and the level of required funding. For each selected contract, the team will look at contract performance, acceleration options, costs to date, costs to go, risk, and an assessment of the contractual position and commercial incentives.

4 Programme and Schedule

- 4.1 The key commitments and dates in Crossrail's Master Operational Handover Schedule (MOHS) 2018 are provided in the appendix A.

5 Appendix

- **Appendix A:** Key milestones from MOHS 2018 schedule
- **Appendix B:** Table of key risks and issues
- **Appendix C:** List of Acronyms
- **Appendix D:** Joint TfL and Bombardier Weekly Report



Appendix A: Key milestones from MOHS 2018 schedule

MOHS Milestones	MOHS2018 date	Status
Traction power Zones 1&2	Feb 18	Achieved
Dynamic testing Zones 1&2	Feb 18	Achieved
Traction power on Zones 3&4	May 18	
High Voltage Non Traction Power Zones 1&2	May 18	
Stage 2 commencement (contingency plan)	May 18	
Dynamic testing Zones 3&4	Jun 18	
Network Rail award west station contract	Jun 18	
Handover of stations and elements to RfL and LU	Jun-Nov	
High Voltage Non Traction Power All locations	Jul 18	
Dynamic testing all zones	Jul 18	
Trial running commences	Aug 18	
Safety case for central section submitted to RAB C	Aug 18	
Trial operations commence	Sep 18	
Submit Approval to Place Into Service to ORR	Sep 18	
Full Stage 2 services	Tbc	
Stage 3 commencement	9 December 18	



Appendix B: Table of key risks and issues

Risk / Issue	Key date	Mitigation / Action
Stage 2 - Paddington to Heathrow, Shenfield to Liverpool Street mainline		
Timely completion of ETCS testing and BT on board signalling approval	On-train testing start 4 May 2018	Close monitoring of software development for passenger service and prioritised joint lab testing at Charleroi, Belgium.
Stage 3 - 9 December 2018 - Abbey Wood to Paddington, Heathrow to Paddington mainline, Shenfield to Liverpool Street mainline		
Timely provision of design assurance information, asset data, key operations/maintenance information.	Systemwide Handover 5 Aug 2018	Maintain focus on design assurance close out rate and drive Tier 1 contractors to provide information in good time
Risk of delays to the Bombardier schedule for installation of the Class 345 on-board TCMS / CBTC (v 6.1.1 & v7) impacts activities for Dynamic Testing.	CBTC Authorised for Trial Running 22Jun18	Prioritisation of software development & testing for Stage 3 in latest BT programme. Revised plans build contingency to start of testing in central section
Risk of delays to commissioning of NR interfaces impacting trial running.	Commence Transition Testing Z1&2 30Jun18 Z3&4 14Jul18	Confirm blockades June & July 18. Confirm the programme for installation of wayside equipment, on board software and testing at PML
Risk of insufficient time to undertake trial operations activity.	Trial Ops 09 Sept 2018	Complete infrastructure and testing as early as possible to allow unimpeded trial operations. Clear definition of minimum requirements. Modelling systems reliability.
Risk of LU readiness being impacted by ongoing construction at stations, spares availability and completion of staff training.	Trial Ops 09 Sept 2018	Station by station Handover execution plans being agreed between CRL and LU due end of March
Preferred delivery option and programme for wifi and 4G for passengers from stage opening and maintenance teams from handover.	Wi-Fi for passengers 9 Dec 2018	Interim on-train wifi solution proposed. Positive initial engagement with MNOs. Commence procurement.



Appendix C: List of Acronyms

Acronym	Description
ATC	Alstom, TSO, Costain joint venture
BT	Bombardier Transportation
CBTC	Communications Based Train Control
CRL	Crossrail Limited
DfT	Department for Transport
ETCS	European Train Control System
LU	London Underground
MNO	Mobile Network Operators
MOHS	Master Operating Handover Schedule
MTS	Mayor's Transport Strategy
ORR	Office of Rail & Road
PML	Pudding Mill Lane
RAB (C)	RfL Assurance Board for Crossrail
RfL	Rail for London
TBC	to be confirmed
TCMS	Train Control Management System
TfL	Transport for London
TPH	Trains per hour



Appendix D: Joint TfL and Bombardier Weekly Report

Elizabeth line - Bombardier Weekly Report 9 April 2018

- 42 trains have been completed in Derby by Bombardier, which is in line with the plan.
- All 15 7-Car trains are now based in Ilford Depot and are available for service on the Liverpool Street to Shenfield line. The day to day availability and reliability of trains is improving.
- Dynamic Testing in the Crossrail tunnels has continued with first use of the 'Protected Manual' mode (driving the train manually but with the train communicating with the signalling system which tells the driver how far and fast it can be driven).
- Further submissions to support the start of testing of full automatic operation of the train in the Crossrail tunnel were submitted on time by Bombardier. Further information is required from Crossrail after which testing in automatic mode should commence on 11 April.
- Assurance submissions and resourcing need to remain a key area of focus both short and medium term as the staged approach to software releases means that the overall amount of assurance work will increase substantially.
- The latest release of train control management software (7.1) has been loaded onto the test train in the Crossrail tunnel. This was released on time and resolves a number of bugs present in the earlier releases. It has improved the efficiency of testing, however a number of bugs remain to be resolved in future releases.
- Bombardier will shortly commence building the next release (7.2) of the train control management software. This release is planned to be approved for passenger service. Defect rectification remains key to the success of Stage 3 operations and extra resources are being applied.
- Starting this week there will be a new weekly meeting focused on closer collaboration between Bombardier, Siemens, Crossrail and TfL. This relationship, covering train and signalling, is vital for Stage 3 testing and passenger service.
- The next Stage of Old Oak Common Depot (Stage B1 – comprising 6 additional sidings) is due to be brought into use on 11 April. This remains on plan.
- TfL Rail is still on schedule to take over the Heathrow Connect services in May 2018, using the existing rolling stock to the airport and Class 345's between Paddington and Hayes and Harlington.
- Driver training on the Great Western route has continued in line with plan. One of the key activities for the success of this plan is an update for some route-specific software functions and this is being addressed urgently by Bombardier. Current dates for resolution are 10 April for release and 7 May for safety approval.



- Scheduled pre-testing of the European Train Control System ('ETCS') in the Heathrow tunnels resumed on 6 April. Laboratory testing is now underway in Charleroi, Belgium allowing some ETCS tests to take place without requiring access to the actual railway at Heathrow.
- The table below includes additional short term milestones, as agreed by the Mike Brown and BT's Chairman during their regular conference call which last took place 22 March. The additional milestones are shown in red



Key Programme Milestones

Stage 2	P80 Programme (V3_5_1) 11 th Jan	Current Forecast
Approval for driver training on Great Western routes excluding European Train Control System	27 Feb	Submitted 5 March
Commence build of TCMS release 7.3 (the Stage 2 passenger service software)	26 June	26 June
Independent Safety Assessment body ('ISA') approval for European Train Control System MR3 software necessary for Stage 2	6 August	6 August
Independent Safety Assessment body ('ISA') approval for TCMS release 7.3	18 September	18 September
Approval for European Train Control System driver training on Great Western	24 Aug	12 Oct
Approvals for European Train Control System Passenger Service	28 Sept	19 Nov
Stage 3		
Completion of Transition testing at Melton ready for Central Operating Section Dynamic Testing	29 Jan	Complete
Commence build of TCMS release 7.2 (the Stage 3 passenger service software)	24 April	24 April
Independent Safety Assessment body ('ISA') approval for European Train Control System MR2 software necessary for Stage 3	22 May	22 May
Approval of CBTC signalling for Central Operating Section Trial Operations	22 Jun	22 Jun
Availability of 22 trains for Trial Running in the Central Operating Section	13 Aug	13 Aug
Approval of Class 345 for Stage 3 Passenger Service	10 Oct	10 Oct
Start of Stage 3 Passenger Service	9 Dec	9 Dec
Old Oak Common Depot		
Section A Brought into Use	1 Mar	Complete
Section B1 Brought into Use	11 Apr	11 Apr
Section C Brought into Use	30 May	30 May

