TRANSPORT FOR LONDON

BRIEFING NOTE

Subject: Weekly Mayoral update on Crossrail / Elizabeth line

Date: 16 April 2018

Manifesto commitment(s)	Draft Mayor's Transport Strategy (MTS)
Not applicable	**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 On 13 April testing of the new trains and infrastructure commenced in full automatic operation. This enables higher speed testing of the rolling stock in the eastern tunnels (between Abbey Wood and Stepney Green).

2.2 Good progress was made last week in fit-out of mechanical and electrical equipment in the western tunnels (Whitechapel to Paddington). All permanent tunnel ventilations fans (except one at Bond Street and one Paddington) have now been installed.

2.3 In order to achieve improved productivity in tunnel fit-out and dynamic testing a new approach will be implemented from the end of April that maximises time in the tunnels for both activities.

2.4 TfL Rail remains on schedule to take over the Heathrow Connect services for Stage 2 from 20 May 2018, using the existing rolling stock to the airport and Class 345 trains between Paddington and Hayes and Harlington. Bombardier have now updated some route-specific software which was loaded onto the train last week and is currently being tested. It is scheduled for full safety approval on 2 May and Bombardier continues to monitor this closely.

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 review 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 (as at Period 12, 03 March 2018)

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 / CBTCS (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.

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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

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Appendix D: Joint TfL and Bombardier Weekly Report

Elizabeth line – Bombardier Weekly Report 16 April 2018

Key Activities and Issues

- 42 trains have been completed in Derby by Bombardier, which is in line with plan.

- All 15 7-Car trains are now based in Ilford Depot and are available for passenger service on the Liverpool Street to Shenfield line. The day to day availability and reliability of the trains continues to improve.

- Dynamic Testing in the Crossrail tunnels has continued using '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 in full automatic operation in the Crossrail tunnel were submitted on time by Bombardier and higher speed testing using the Automatic mode commenced on 13 April rather than 11 April because of Crossrail's safety assurance sign off.

- Since 10 April, tunnel testing has used release 7.1 of the train control management software. This release resolves a number of issues with earlier versions. It has improved the efficiency of testing, however a number of bugs remain to be resolved in future releases.

- Assurance submissions and resourcing remains a key area, as the staged approach to software releases means that the overall amount of assurance work will increase substantially. Bombardier are reviewing and strengthening their process, resources and internal governance.

- From 24 April Bombardier will commence building the next release (7.2) of the train control management software. This release will be developed and approved for passenger service. Following testing on rigs and test tracks, checks are being undertaken to ensure that all known defects are addressed in release 7.2. There are some issues from testing which need to be addressed in future releases of Siemens signalling software where they relate to the Siemens part of the system. Defect rectification remains key to the success of Stage 3.

- The first weekly meeting of the group driving closer programme integration between Bombardier, Siemens, Crossrail and TfL took place on 11 April. This relationship, covering train and signalling, is vital for Stage 3 testing and passenger service.

- Six additional sidings were brought into use at Old Oak Common Depot, on schedule, on 11 April. This is good news but the focus remains on the next stages of signalling and bringing into use as well as 'snagging' and rectifying defects in the currently operational parts of the depot.

- TfL Rail remains on schedule to take over the Heathrow Connect services in May 2018, using the existing rolling stock to the airport and Class 345 trains between Paddington and Hayes and Harlington.

- One of the key activities for the success of this plan is to update some route-specific software functions which Bombardier have addressed. The software was updated, on schedule, on 11 April and is currently being tested as the train was arrived a day later from Ilford Depot. It is scheduled for full safety approval on 2 May and Bombardier continue to monitor this closely.

- Scheduled pre-testing of the European Train Control System ('ETCS') in the Heathrow tunnels resumed on 6 April. Laboratory testing continues in Charleroi, Belgium allowing some ETCS tests to take place without requiring access to the actual railway at Heathrow. So far the testing is going well but there are significant stages before passenger service ready software is available in the autumn.

Key Programme Milestones – **changes from the last report are shown in red**

Stage 2	P80 Programme (V3_5_1) 11th 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	Complete
Section C Brought into Use	30 May	30 May

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