

TRANSPORT FOR LONDON

BRIEFING NOTE

Subject: Weekly Mayoral update on Crossrail / Elizabeth line

Date: 13 August 2018

Manifesto commitment(s)

Not applicable

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 High-level items:

- 2.1 A proposed revised delivery schedule will be discussed with the CRL Board on 29 August, followed by the Sponsor Board on 3 September. The Mayor will then be updated at the regular TfL meeting in early September (the date of which is currently being confirmed with the Mayor's Office).

3 Routeway construction:

- 3.1 All routeway installation is due to be completed before the end of October with the priority on completing works that are intrusive, resource heavy and engineering train dependent to enable the start of 5-day Dynamic Testing. Testing of the routeway systems can be coordinated with Dynamic Testing.
- 3.2 Critical programme metrics for routeway construction are tracked weekly and actively monitored by CRL. Progress against plan can vary week by week as the contractor coordinates and prioritises its activity:
 - **Cabling:** 94 per cent complete (vs forecast 97 per cent complete), 12,000m installed in the week – this equates to an increase of 0.4 per cent compared to last week
 - **Tunnel Walkways:** 85 per cent complete (vs forecast 79 per cent complete): 1500m installed in the week



- **Firemain:** 89 per cent complete (vs forecast 89 per cent complete), no progress planned due to the handover of the tunnels from the construction teams to enable Dynamic Testing last weekend
- **Drainage:** 89 per cent complete (vs forecast 91 per cent complete), no progress planned due to the handover of the tunnels from the construction teams to enable Dynamic Testing last weekend
- **Permanent tunnel ventilation:** 95 per cent complete (vs forecast 96 per cent complete) with progress made on IRNs, and cable glanding and terminations - this equates to an increase of 0.6 per cent compared to last week.

- 3.3 All cabling for communications (which is key to mission critical control and radio systems) has now been installed and will need to be tested. There is a major challenge in securing sufficient testing resources from Siemens. Pressure is being applied on Siemens to secure additional resources as well as recruitment from wider UK and international industry.
- 3.4 Static testing of all assets is behind plan. Measured by the first testing stage of Interim Release Notes (IRN), actual completion is at 45 per cent (vs plan 79 per cent). IRNs are being prioritised and actively monitored by all contracts but progress is delayed by both the resource challenges to produce the evidence documentation and the progress of the physical works. CRL are monitoring the process across all sites.

4 Signalling implementation and testing

- 4.1 All cabling for signalling has now been installed within all Zones and now needs to be tested. There is a similar challenge to the communications contract in securing the necessary resource from Siemens and this is also being managed via regular contact with Siemens.
- 4.2 All signalling equipment is now installed and the power has been turned on for the signalling transition on the eastern route.
- 4.3 Testing of the signalling transition on the eastern route took place on 11 and 12 August with the possessions on the Great Eastern being set up and handed back on time. Trains were successfully moved between the Central Operating Section and Maryland to test signalling radio coverage and check the track database.
- 4.4 The testing activities identified a number of significant and complex issues which are being actively investigated to either fully resolve or establish a practical workaround prior to the next Dynamic Testing Window in 2 weeks' time. Siemens and Bombardier are actively working on the following key issues that were identified:
- Difficulties with getting the train to successfully operate in CBTC modes whilst the on-board ETCS equipment is active.
 - Errors in the differences between the messages provided and what the train was expecting.
 - CBTC electronic beacon (placed between the rails of a railway as part of an automatic train protection (ATP) system) positioning issues leading to emergency brake applications.



- 4.5 Installation of equipment for the signalling transition on the western route is nearing completion prior to testing during the dynamic testing window 8-9 September.

5 Train production and testing

- 5.1 A detailed update on progress with Bombardier is provided in Appendix A.

6 Stations

- 6.1 All central stations¹ are working towards staged completion dates (currently between beginning October and mid-November). Interim maintenance arrangements are being put in place and subsequent full handover dates being agreed (with the Infrastructure Managers (LU and RfL)).
- 6.2 Switching on the permanent high voltage power for stations will be completed during August.
- 6.3 Schneider Electric has now completed inspections of its circuit breakers installed in low-voltage switchboards on Crossrail sites. No faults were identified and the stations low-voltage systems can now be powered.
- 6.4 Overall station completion is measured periodically/every four weeks. The Period 4 results are:

	Actual (%)	Planned (%)
Paddington	93.3	97.1
Bond Street	88.6	91.6
Tottenham Court Road	92.8	95.6
Farringdon	97.9	98.3
Liverpool Street	91.8	93.7
Whitechapel	92.8	97.5
Woolwich	95.4	97.3

7 Network Rail works for each stage

- 7.1 Network Rail is currently focussing its activities on:
- Finalising a delivery plan that will complete traction power upgrade works by May 2019 (modelling has been completed and is currently being analysed, although Network Rail have yet to confirm an agreed programme)
 - Completion of ticket hall modifications, station refurbishments and assurance activity
 - Driver Only Operation CCTV installation at Stratford and Shenfield
 - Station Information and Security System (SISS) installation and connectivity to the control centre in Romford

¹ Except Custom House which will go direct to handover (target date end-August)



Stage 5:

- 7.2 The contract award for the six western stations (Acton Mainline, Ealing Broadway, West Ealing, Southall, Hayes & Harlington, West Drayton) is now forecast for [REDACTED].
- 7.3 Network Rail has notified CRL that [REDACTED]. Mike Brown and Simon Wright discussed this with the new Chief Executive of Network Rail, Andrew Haines, at a meeting on 13 August. Network Rail outlined a programme of value engineering (without affecting key station scope) and alternative funding sources they plan to explore before considering an approach for additional central Government funding. They are still planning to undertake enabling work at the western stations over the important Christmas works period.
- 7.4 The contract award for Ilford and Romford is now scheduled for [REDACTED] 2018 (was [REDACTED] 2018).
- 7.5 Completion of western outer platform extensions and Driver Only Operation CCTV – work is scheduled to commence in October 2018 which is on time for delivery.

8 Approvals for each stage

- 8.1 Overall approvals for each stage are tracked on a periodic basis. The key approvals for Stage 3 are as follows:

Stage 3 (base plan being revised in view of wider programme schedule pressures)

- ORR issues Amended/New (TBC) Safety Certificate for Yellow Plant (due in October and currently no major issues with reaching this date)
- ORR issues Authorisation to Place into Service (APIS) for Engineering Trains (complete)
- ORR issues APIS for Rail Profiling Machine (on track to be delivered in September)
- ORR issues APIS for central section to CRL (October date at risk)
- ORR issues APIS for South East Spur (NR scope) to NR (due October 2018 currently no major issues with reaching this date)
- RAB C (assurance body for Crossrail) final safety sign off (December date at risk)

Stage 2 Phase 2

- ORR issue APIS for ETCS trackside (due in August no major issues with reaching this date)
- ORR issues APIS for On-Board signalling (ETCS) (November date at risk)



- MTR-C Safety Validation Panel approval for driver training with ETCS
(timing tbc – pending urgent review by Bombardier senior management)
- MTR-C Safety Validation Panel approval for Passenger service
(timing tbc – pending urgent review by Bombardier senior management)

9 Appendix

9.1 Appendix A: Joint TfL and Bombardier Weekly Report



Appendix A: Joint TfL and Bombardier Weekly Report

Elizabeth line - Bombardier Weekly Report 13 August 2018

Note No: 21

Key Activities and Issues

- 54 trains have been completed in Derby by Bombardier, which is in line with the plan. TfL has [REDACTED] new trains pending delivery of further software and assurance to allow greater use of the units on Network Rail infrastructure and also confirmation of Bombardier's updated reliability growth programme.
- Old Oak Common Depot was brought into full use on 23 July, only minor work remains to complete and formally handover the Depot.
- Four 7-Car trains continue to be used on TfL Rail services between Paddington and Hayes & Harlington based at Old Oak Common. Ten 7-Car trains are available for passenger service on the Liverpool Street to Shenfield line with one unit at a time taken to Wembley Depot for modifications. Availability continues to be excellent on both routes.
- Bombardier remains focused on reliability growth. Bombardier's current plan is for a mean distance between service affecting failures (MDSAF, a standard industry measure based on any delay over 3 minutes caused by a train fault) of 5,000 miles by end of Period 5 (18 August) and 13,000 by end of Period 8 (10 November) against a programme of modifications and improvements. The most frequent failure (though with small impact per incident and seen on the 7-car fleet only) is the loss of the driver's information screen, which then has to be reset. MDSAF in the last four weeks has increased and ranged between 4,600 and 7,500 miles.
- The latest dynamic testing 'window' took place on 11-13 Aug, including testing the transitions to and from the Network Rail Great Eastern line. Considerable effort went into gaining the approvals necessary for this testing including advance runs during normal traffic hours. There were a number of issues arising from the tests involving trackside signalling and connected on train software and the logs from the tests are being analysed by Siemens and Bombardier in readiness for the second set of transition tests in two weeks' time.
- A further train software release (7.2.2) has been built and is now being tested on the rigs at Derby and at Melton test track. Testing was slightly delayed last week by a configuration failure in the associated Siemens signalling software. This is expected to be rectified very shortly and in the meantime testing of other functions has continued. The focus for 7.2.2 is to use it for Crossrail Test Window 12 (29 September) and also from that date for running in traffic hours on Network Rail, which will allow the 9-Car units to substantially increase the mileage operated and help build reliability prior to use in the tunnels.



- Weekly meetings continue between Bombardier, Siemens, Crossrail and TfL, to coordinate software releases, testing and bug fixing. This includes taking account of delays to central section infrastructure and changes to dynamic testing. Direct Bombardier/Siemens liaison and escalation meetings are also taking place. The Crossrail project is still looking to further strengthen its system integration capability and resource.
- Due to the delay to completion of Release 7.2.2, the build and testing of Release 7.3 (to be used for Heathrow services) has been delayed. Bombardier now believe that this will impact the existing driver training (12 Oct) and public service approval (19 Nov) dates for the Heathrow software. The updated programme for Releases 7.2.2 and 7.3 is yet to be finalised (dates shown as TBC in the milestone report overleaf) and clarity, and further improvements, are being urgently sought by TfL. Bombardier senior management are examining the possibilities to mitigate after which they will provide an updated programme to TfL.
- With a large amount of testing and a number of releases, updates and derogations all requiring approval, assurance is, once again, an increasing focus. Assurance resources and production of evidence are critical constraints on the ability to bring updated software into use. Bombardier is seeking to increase the number of signalling assurance engineers.



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	Completed
Commence build of TCMS release 7.3 (the Stage 2 passenger service software)	26 June	Commenced 30 July
Independent Safety Assessment body ('ISA') approval for European Train Control System MR3 software necessary for Stage 2	6 Aug	To be confirmed
Independent Safety Assessment body ('ISA') approval for TCMS release 7.3	18 Sept	To be confirmed
Approval for European Train Control System driver training on Great Western	24 Aug	To be confirmed
Approvals for European Train Control System Passenger Service	28 Sept	To be confirmed
Stage 3		
Completion of Transition testing at Melton ready for Central Operating Section Dynamic Testing	29 Jan	Completed
Commence build of TCMS release 7.2 (the Stage 3 passenger service software)	24 April	Completed
Independent Safety Assessment body ('ISA') approval for European Train Control System MR2 software necessary for Stage 3	22 May	Completed
Approval of CBTC signalling for Central Operating Section Trial Operations	22 Jun	Completed
Availability of 22 trains for Trial Running in the Central Operating Section	13 Aug	Unit Acceptance Paused
Approval of Class 345 for Stage 3 Passenger Service	10 Oct	29 Oct
Start of Stage 3 Passenger Service	9 Dec	9 Dec
Old Oak Common Depot		
Section A Brought into Use	1 Mar	Completed
Section B1 Brought into Use	11 Apr	Completed
Section C Brought into Use	30 May	Completed

