

TRANSPORT FOR LONDON

BRIEFING NOTE

Subject: Weekly Mayoral update on Crossrail / Elizabeth line

Date: 28 August 2018

Manifesto commitment(s)	Mayor's Transport Strategy (MTS)
Not applicable	<p>A good public transport experience</p> <p>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.</p>

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 Routeway construction:

- 2.1 Critical programme metrics for routeway construction are tracked weekly and actively monitored by CRL. Progress against the plan can vary week by week as the contractor coordinates and prioritises its activity:
 - **Cabling:** 96 per cent complete (vs forecast 97 per cent complete): 4,925m completed in week
 - **Tunnel Walkways:** 88 per cent complete (vs forecast 86 per cent complete): 844m completed in week
 - **Firemain:** 89 per cent complete (vs forecast 89 per cent complete): Two anchors, five hydrants and 3 valves installed
 - **Drainage:** 89 per cent complete (vs forecast 92 per cent complete): all stations shafts and portals tie-in inspections completed
 - **Permanent tunnel ventilation:** 96 per cent complete (vs forecast 97 per cent complete): Final completion is pending the Installation Release Notes (IRN) sign off, snagging items and resolution of constraints around Bond Street West
- 2.2 Availability of resources for testing of communication equipment continues to constrain testing activities. Although testing activities are not on the critical path for Dynamic Testing, the completion of testing is required for the start of Trial Operations. A revised schedule has been prepared by CRL that will require fewer resources, though



still more than presently available. CRL is investigating how to source more trained resources with Siemens.

- 2.3 Static testing of all assets is behind plan. Measured by the first testing stage of IRN's, 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 slowed by both the resource challenges to produce the evidence documentation and the progress of the physical works. CRL is monitoring the process across all sites and is reviewing the latest IRN completion statistics for accuracy.

3 Signalling implementation and testing

- 3.1 Dynamic Testing window number 9 took place this weekend between Friday 24 August and Tuesday 28 August. Testing included:

- Transition Testing on the interface to the Great Eastern (primarily Route Accessibility Testing)
- Line speed increase tests between Liverpool Street and Canary Wharf and between Whitechapel and Pudding Mill Lane
- Route Accessibility Testing between Farringdon and Paddington
- Electronic beacon / transponder testing in Westbourne Park
- Bombardier Testing of Transparent Link between signalling systems and Communications and Control Systems
- Radio system testing in the vicinity of Pudding Mill Lane
- Electromagnetic Compatibility (EMC) testing at Custom House and Plumstead

- 3.2 After some difficulties initially with the stability of the trains, all planned tests were undertaken during Dynamic Testing window number 9. Following route accessibility testing, line speed has now been achieved throughout the Central Operating Section east of Paddington. Planned transparent link, radio and EMC testing was completed. Transition tests were undertaken on the interface with the Great Eastern and results are being analysed.

- 3.3 The next test window is scheduled for 8 and 9 September to complete any remaining tests on the Great Eastern transition.

- 3.4 CRL will switch from the current approach to Dynamic Testing of 11 day construction/3 day testing to a 5 day testing/2 day construction approach on 5 November 2018, instead of the previous estimate of 22 October 2018. This will allow a more concentrated focus on software testing and any bug fixing required.

4 Train production and testing

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



5 Stations

- 5.1 Progress on station escalators is between 92 per cent and 98 per cent complete across the programme. Fit-out of escalator equipment starting at Bond Street.
- 5.2 Overall station completion is measured periodically/every four weeks. The Period 4 results are:

	Actual (%)	Planned (%)
Paddington	93.9	93.9
Bond Street	91.9	94.3
Tottenham Court Road	94.8	98.0
Farringdon	98.0	98.6
Liverpool Street	92.4	93.7
Whitechapel	93.5	98.2
Woolwich	95.5	98.0

6 Network Rail works for each stage

Stage 5:

- 6.1 A follow-up meeting was held on Monday 20 August to continue the review of available options in regards to the expected cost gap of [REDACTED] for the western station enhancement works. Network Rail is preparing an options report to share with Sponsors that will outline the available options and the priorities for the works.
- 6.2 NR are still planning to undertake enabling work at the western stations over the important Christmas works period that will include the installation of the overbridges.
- 6.3 Local authorities are likely to challenge vigorously any reductions in scope or delays to delivery. This will add to schedule pressure which will have already been extended by the potential need to reprice the works.

7 Approvals for each stage

- 7.1 The overall approvals for each stage have not changed since the last weekly update.

8 Appendix

- 8.1 Appendix A: Joint TfL and Bombardier Weekly Report



Appendix A: Joint TfL and Bombardier Weekly Report

Elizabeth line - Bombardier Weekly Report 28 August 2018

Note No: 23

Key Activities and Issues

- 54 trains have been completed in Derby by Bombardier, in line with the plan. TfL has [REDACTED] new trains pending delivery of further validated software to allow greater use of the units on Network Rail infrastructure, and further reliability improvement of the existing fleet. The initiatives are summarised below, and there is an urgency such that train delivery can be re-established to complete acceptance of the balance of the fleet by summer 2019, as originally scheduled and at the planned steady and sustainable rate.
- Old Oak Common Depot is in full operation. The fourth (of four) routes into and out of the depot has yet to be brought into use but the works rest with Network Rail on their infrastructure.
- 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, increasing in the next month to eleven with the conclusion of train modification works. Availability continues to be excellent on both routes.
- Bombardier's current reliability growth 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) supported by a programme of modifications, progress with which is tracked weekly. The most common event (though with small impact per incident and seen on the 7-car fleet only) is still the loss of the driver's information screen requiring a manual reset, but the root-cause defect requires a train-control software update to permanently correct. MDSAF in the last month has ranged between 4,300 and 8,200 miles.
- The last Central Section dynamic testing 'window' took place on 24-27 Aug involving further testing of the transitions to and from the Network Rail Great Eastern line. The testing was relatively productive but there were a number of issues with getting the trains working consistently in 'integrated' mode (all on-train signalling systems working simultaneously, as is required for transitions testing) and an error in the trackside signalling programming all of which affected testing efficiency.
- New Siemens signalling software for the Central Section, correcting test-blocking defects in a previous version has been delivered to the Melton test-track and will be married in the next week with an updated 'R7.2.2' train-software release for integrated testing through to the end of September. The focus is on completing sufficient testing to use this new configuration in Crossrail Test Window 12 (29 September), and also validating a derivative in mid October 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 Central Section 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. A plan to further strengthen the Crossrail project's system integration capability and resource is now in development.

Development testing for Release 7.3 on-train software to be used for Heathrow services over the European 'ETCS' signalling system has continued ahead of the next test run on 31st August, but delays to the BT/Siemens Central Section R7.2.2 software has continued to impact the Release 7.3 programme. Bombardier has this week submitted a programme, currently under review by TfL, which delivers the R7.3 train software configuration tested and validated for passenger service by 6 February 2019. TfL and BT are exploring the potential to bring this date forward, but this would not be straightforward as it would also require a specific safety case to allow sufficient time for driver familiarisation and training in advance.

- With a large amount of testing and a number of software releases, updates and derogations all requiring approval, assurance is a continuing focus. Assurance resources and production of evidence are critical constraints on the ability to bring updated software into use. Bombardier continues to seeking an increase in the number of signalling assurance engineers.



Key Programme Milestones

Stage 2	P80 Programme (V3_5_1) 11thJan	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	8 Oct Under review
Independent Safety Assessment body ('ISA') approval for TCMS release 7.3	18 Sept	26 Nov Under review
Approval for European Train Control System driver training on Great Western	24 Aug	Under review
Approvals for European Train Control System Passenger Service	28 Sept	6 Feb 19 Under review
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	16 Nov
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

