

UNDERGROUND UPDATE

by John Hawkins

Editor's Note: These items were compiled before the Coronavirus problems and thus any projected dates could well be missed.

TfL PROGRAMMES AND INVESTMENT COMMITTEE MEETING OF 5 MARCH 2020

Apart from major papers, reported separately, this meeting reported on a number of matters, summarised below.

An updated Strategic Outline Business Case for Crossrail 2 issued in September 2019 is expected to be considered as part of a Spending Review during 2020. The TfL and Network Rail Integrated Project Team is presently consolidating the work to date into an updated baseline for the scheme, while developing designs to support third-party works such as HS2 and preparing plans to start the detailed scheme development in the event that the Government and the Mayor decide to move forward following the Spending Review. "Before starting the next stage of development, a route-wide consultation on any proposed first phase of Crossrail 2 will be undertaken". Phasing of the project has not previously been mentioned in these reports. A new baseline will be completed in the first quarter of 2020/21, and will form the basis for a route wide consultation.

Even a new line has historic links which prevent simplification. The Crossrail traction power infrastructure was designed at a time when Network Rail was to be the Infrastructure Manager for the tunnel Section. Following a decision in 2012 for TfL to take on this role, it remains the case that the infrastructure is designed such that incoming electrical feeds are controlled by Network Rail from their control rooms, and are linked with other sections of Network Rail.

At Upminster Depot, all site works have been completed including the extended wheel lathe, new training rooms, and upgraded cleaning, maintenance and lifting sheds. At Ealing Common Depot the four road train stabling shed is commissioned, and works on the remaining shed are on target to be completed by year end. Further 4LM works to improve reliability are planned for progressive implementation over the next three months (*i.e. to end of May 2020*), and all planned works will be completed prior to further roll out of the system to SMA3. Commissioning of the final signalling area to Uxbridge remains on schedule to support the final service frequency increases in 2023.

Works for updated signalling to enable 18 trains per hour on the East London Line of London Overground are planned to be implemented in summer 2020 ahead of the December timetable change. TfL were awarded Housing Infrastructure Fund money to carry out infrastructure changes to accommodate several housing developments in the Surrey Quays area. The schemes include redevelopment of Surrey Quays station with a new entrance, a new Overground station at Surrey Canal Road, and power and stabling changes to enable future 20 tph on that line.

Schemes that met the Growth Fund criteria are:

- A new southern entrance at Ilford station to benefit bus passengers.
- An upgrade at Colindale station in the first phase of a development programme
- An upgrade at Walthamstow Central, with improved station entrances and step-free access.
- A new DLR station, Thames Wharf, to support the Thameside West development.

DLR continue to progress the Royal Docks Station Upgrades programme, including a start on site in 2020/21 at Beckton Park and Royal Victoria stations to deliver congestion relief and passenger experience improvements.

LU RENEWALS AND ENHANCEMENTS FLEET PROGRAMME

The LU Renewals and Enhancements Fleet Programme was detailed to the TfL Programmes and Investment Committee meeting on 5 March 2020.

Exemptions to the Rail Vehicle Accessibility Regulations (RVAR) have been granted by the Department for Transport. The Bakerloo Line fleet has until the end of 2021 and the Central and Waterloo & City Line fleets have until the end of 2024 to complete agreed disability access modifications. The Piccadilly Line has been granted an exemption until the end of 2026 to coincide with fleet replacement.

The Central Line Improvement Programme (CLIP) is installing a prototype traction system on the first train at Derby. A second train is being fitted with the prototype on-train computer as well as a prototype bay for wheelchair users, and other accessibility modifications. A third train has been provided to CLIP

to begin work. The first train will be completed in Autumn 2020. By Summer 2020, the new workshop at Acton is scheduled to be available for CLIP to enable full production.

Accessibility modifications and reliability improvement work to extend the life of the Bakerloo Line trains until they are replaced continues, having recently completed the structural repairs. Design of RVAR related accessibility improvements has progressed into prototyping. Installation of wheelchair bays alongside a new passenger information system is scheduled to complete by the end of 2021.

Removal of asbestos in existing battery locomotives has started to ensure TfL is compliant with Asbestos Regulations. Feasibility studies have commenced on heavy haulage capability to support Engineering Vehicles and the Track Renewals Programme, the project stretching to 2028/29. A new project has been initiated to mitigate impacts from the 4LM signalling upgrade on the existing Track Recording Vehicle (TRV).

This will allow for its continued operation on sub-surface lines and will be completed by Autumn 2020. In addition, life extension works for the TRV have aligned with a new project to ensure continuous service until a replacement is in service in 2023/24. The prototype of a specialised vehicles to mechanise deep tube concrete track renewal is being progressed in-house. Operation of the first vehicle is planned for early Summer 2020. Ruislip Depot concept plan has been developed, and site surveys commissioned to develop designs to support the new Engineering Vehicles.

November 2019 saw the successful delivery of two Kirow cranes and eight tilting wagons ahead of schedule as part of the Mechanisation of Points & Crossings Renewal programme. Testing and commissioning is planned to be ready for delivery of major track renewals from 2020/21.

Mechanisation of Ballast Replacement to increase productivity has been deferred until a ballasted track renewal approach is confirmed. An investigation into low rail adhesion systems to mitigate the effect of leaf-fall on the network was also deferred to allow development of an adhesion management strategy.

Procurement of 73 new wagons by the end of 2021 to support track renewal and maintenance activities progresses, with the start of production of seven wagons for testing. Procurement of an additional two wagons for the replacement track monitoring capability has been agreed.

Provision of increased control for Train Operators over unauthorised access into the operator cabins from the train saloon, known as Cab J-Door Security Improvements, has seen the project developed a prototype which was installed on a train to demonstrate how the new system would work. A contract has been placed for the design and supply of the new security system. Installation will begin first on the Waterloo & City Line trains and will progress across all fleets over the next year.

Victoria Line Projects see refurbishment works including repair of flooring as well as reducing dust inside the saloon. This rolling schedule of works will continue until 2024/25.

SIGNALLING AND CONTROL PROGRAMME

The LU Signalling and Control Programme report to the Programmes and Investment Committee meeting on 5 March 2020 reveals a widespread need for system renewals, including for the latest signalling only commissioned in 2014. The signalling and control systems on four lines were planned to be replaced as part of DTUP, but the programme is currently under review. The PICU success suggests a similar project for the Bakerloo Line, although an upgrade of trains and signalling could be combined with the Lewisham extension project. The programme will extend the life of Central Line signalling and control systems, and replace Northumberland Park depot signalling with a new location non-specific design which may also suit Stonebridge Park. The Central Line passenger information system upgrade has tested new software and station hardware, and will extend to the Waterloo & City Line, where the control system hardware and operating system is also being replaced. Bakerloo Line signalling software has been rewritten in a modern computer language.

Component obsolescence within the Jubilee and Northern Line signalling systems is being addressed. The extent of Piccadilly Line signalling life extension works will depend upon the likely delay in funding a new signalling installation. The Central Line life extension project has been quoted significantly above budget, and may require line closures to reduce its duration.

Point machines have been replaced across the network under the 'M63 point machine' replacement project, rationalising the number of point machine variants previously used. Whereas before, LU had seven variants, there are now only two on the Central, Sub-Surface, Jubilee, Northern and Piccadilly lines. This has led to a reduction in the amount of maintenance training required, as well as the number of unique spares required to keep the points safe and reliable. The project has completed the replacement of 81 sets of points.

PICCADILLY LINE UPGRADE STAGE 1

The new Piccadilly Line trains will have 9 cars and be 7 metres longer than current 6-car trains. The new trains will provide a 9.5% increase in passenger capacity, compared with the existing trains at today's service level. This will increase peak trunk capacity from 99,000 passengers at today's service level, to 122,000 passengers with a 27 tph peak service. This represents a 23% overall increase in peak service capacity, with nearly 20% reduced annual energy consumption compared with today's service. Train production is on target to start from August 2021, to ensure that the first new train can be introduced into service from Autumn 2024, with all the existing Piccadilly Line trains replaced by mid-2026.

Preparatory work is progressing with planning and procurement for the upgrading and modification of Piccadilly Line infrastructure to allow the introduction of the new trains. Such works include:

- (a) Design has commenced for the provision of new platform humps at step-free stations.
- (b) A new CCTV system for the Platform-Train Interface into the new train cabs.
- (c) The construction of modern, efficient and environmentally sustainable train maintenance and stabling facilities at Cockfosters and Northfields depots, with increased train stabling capacity at South Harrow Sidings.
- (d) Upgrading of the traction power supply and distribution network to provide system capacity to support the increased performance and energy saving features of the new trains (such as regenerative braking).
- (e) Modifications to the existing legacy signalling system to ensure compatibility with the new trains.

An initial group of train operators will operate the first two trains, and will be involved in coaching and training their colleagues. An off-site testing facility will allow train reliability and integration testing to be performed away from the LU network. Other related projects include the development of aluminium power cabling as an alternative to copper cables, a new design of platform tunnel air cooling panel solution with the aim of improving cooling efficacy and cost effectiveness, and the mechanisation of cable route and cable installation. This is PLU Stage 1 to deliver 94 new trains by 2026. Unfunded Stage 2 is planned to replace existing signalling and procure seven additional trains to provide faster more reliable up to 36tph automatic train operation by 2030.

Source: Programmes and Investment Committee meeting papers for 5 March 2020.

HEAVY HAULAGE FEASIBILITY STUDY

The current engineering fleet of 29 locomotives are in excess of 50 years old, and some vital components are approximately 100 years old. They deliver the track renewal programme and other maintenance needs. They were recently upgraded to operate on 750 volts and will have 4LM signalling equipment fitted, but insufficient axle space remains to fit a future DTUP signalling system when required. Further, the new Matisa Tampers, when hauled, have had to operate at downgraded braking performance levels to match the limited braking capability of the locomotives. This restriction has resulted in road transfers at times, and will also apply to the newly delivered Kirow cranes and tilt wagons, and the new wagons on order. The current TfL Business Plan anticipates a full locomotive fleet replacement to provide LU's heavy haulage capability needs, and so a heavy haulage feasibility study is being undertaken to determine a recommended option including delivery programme, with consideration of life extension works and ongoing maintenance on the current engineering fleet for perhaps 8-10 years until full replacement.

CONDUCTOR RAIL FOR RESTRICTED CLEARANCES (CLR)

A 2016 document defines a composite conductor rail to replace existing 42kg/m conductor rails used on sections of the deep tube, and angle-iron positive conductor rail used on the Central Line between White City and Liverpool Street, where there is in both cases insufficient tunnel clearance to install a standard composite conductor rail section of 65kg/m. These rail sections are no longer commercially manufactured. In the short term, there is a need to support Central, Northern and Piccadilly Line operations once current stocks have been used. In the medium term there is a need to support the DTUP project, who currently have no solution for replacing the reduced clearance sites with composite conductor rails. The long-term TfL business plan is to replace all existing steel section conductor rails with composite conductor rails, with a view to improving energy efficiency across the whole network. The centre line of positive conductor rail is installed at a lateral distance of $406 \pm 10\text{mm}$ from the running edge of the adjacent running rail. The Central Line angle iron conductor rail head is installed at 115mm above rail level to improve the electrical clearance between the conductor rail and the tunnel lining. The normal height for positive conductor rail is 75mm above the running rail. Conductor rail should have a minimum design life of 40 years.

TfL BOARD MEETING – MARCH 2020

LU year-on-year underlying passenger journeys grew at 2.4% in the first half of 2019/20, but since mid-October 2019 growth rates have been reducing. Year-on-year demand growth is down significantly to 1.2% and the past four weeks have seen negative growth of -1.6%, a worsening from 12-week trend of -1.0%. (Source Finance Report presentation to TfL Board to end of period 11, 2019/20, the year-to-date period ending 1 February 2020.) The number of journeys outside Zone 1 has been in decline over the last two years, which likely reflects a reduction in discretionary journeys, probably caused by a continued squeeze on household incomes.

Continued employment growth is contributing to robust commuter demand.

The assumptions built into the 2020/21 Budget include a small number of service improvements and station upgrades that increase demand. TfL advertising estate is one of the most valuable in the world, accounting for 20% of the UK's and 40% of London's outdoor advertising value. TfL have an extensive pipeline of sites and a target to deliver 10,000 homes, with a target of making 50% of homes affordable.

Strategic budget milestones listed include Northern Line extension test train running by November 2020, the same month London Overground signalling is installed and ready for testing and commissioning in east London to enable 18tph. Central Line improvement works should be complete on the first Central Line train, and ready to return to service by January 2021. Victoria Line should complete the heavy overhaul of all trains in the Victoria Line fleet by February 2021, when detailed design of new DLR trains will also be complete.

Resignalling should be complete across the northern section of the Circle line by March 2021, ready for future increased service frequency, the same month detailed design of the new Piccadilly Line trains is completed. Half of these trains will be built in Goole, once the facility is completed. (Source: TfL Board paper for 18 March 2020 meeting).

ELEPHANT & CASTLE

Elephant & Castle station planning application shows proposals for step free access to the Northern Line platforms from the new shopping centre. An upper triple bank of escalators will lead down to the ticket hall which could eventually link to new platforms on the Bakerloo Line Lewisham extension. A second triple bank of escalators leads to the current Northern Line overbridge level by the existing lift shaft, providing links to both platforms by stairs. Both escalator banks also have a pair of lifts for step-free access, the lower one continuing to a third landing at platform level to link with the southbound platform. Step free access to the northbound is provided from the overbridge level by way of a long new overbridge linking to a single lift shaft down to the south end of that platform. Stairways are also provided to spread use between new and existing routes. An apparent fire department lift to the surface is also sited near the platforms, with accompanying five-flight staircase.