

Farringdon City Sidings – A Case Study by Piers Connor

Adapting Infrastructure

Much of Britain's railway infrastructure is over a century old. Most of it was built between 1830 and 1900. In many places, it has been improved and updated from time to time as funding and business needs allow but most of it would still be easily recognised by the Victorian engineers who built it.

Railway infrastructure was, and still is, expensive to build, so it is worthwhile to keep it in good condition and continue to use it as far as possible but it isn't always possible to meet the needs of the modern railway system without changes to the original infrastructure or without adapting it to meet new requirements and standards.

This case study looks at one such project in London, where the introduction of the suburban routes now known as Thameslink and then the modernisation of the Sub Surface lines of the Underground has generated a series of changes to the use of railway infrastructure originally built in the 1860s. This section of the railway is known as the City Widened Lines (Figure 1).

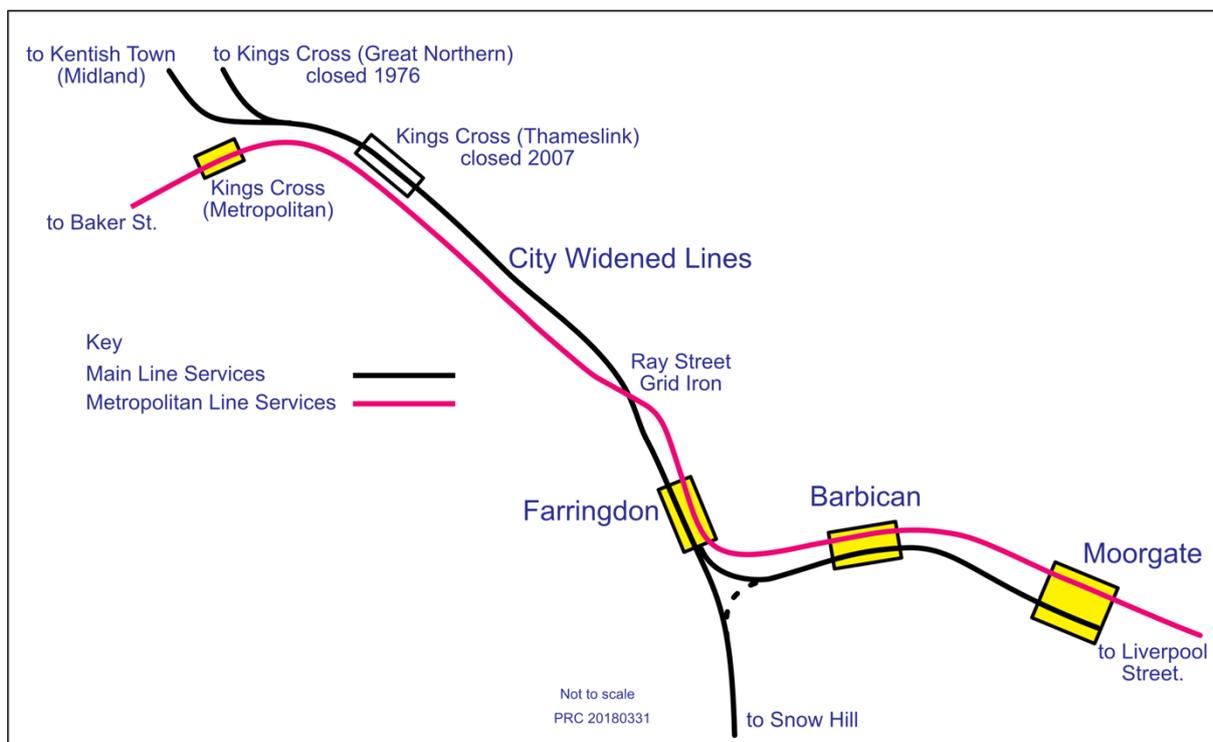


Figure 1: Schematic map of the City Widened Lines used by Thameslink and the adjacent London Underground Metropolitan line. The Metropolitan line passed over the City Widened Lines on a flyover structure known as the Ray Street Grid Iron. Drawing: P. Connor.

The City Widened Lines

The City Widened Lines form the central core of what is now the Thameslink route between Kings Cross and Farringdon and it originally extended through to Moorgate. It runs parallel to the Metropolitan line of the London Underground.

The first part of this route was opened in 1863 as a simple double track railway, built mostly underground between Paddington and Farringdon along what we now know as the Metropolitan line. It is also used by Hammersmith and Circle trains. The line was extended to Moorgate in 1868 and an extra pair of tracks was added between Kings Cross and Moorgate. The extra tracks became known as the City Widened Lines (CWL). They provided

access to Moorgate for main line suburban trains from the Great Northern Railway via their terminus at Kings Cross and for Midland railway trains from Kentish Town.

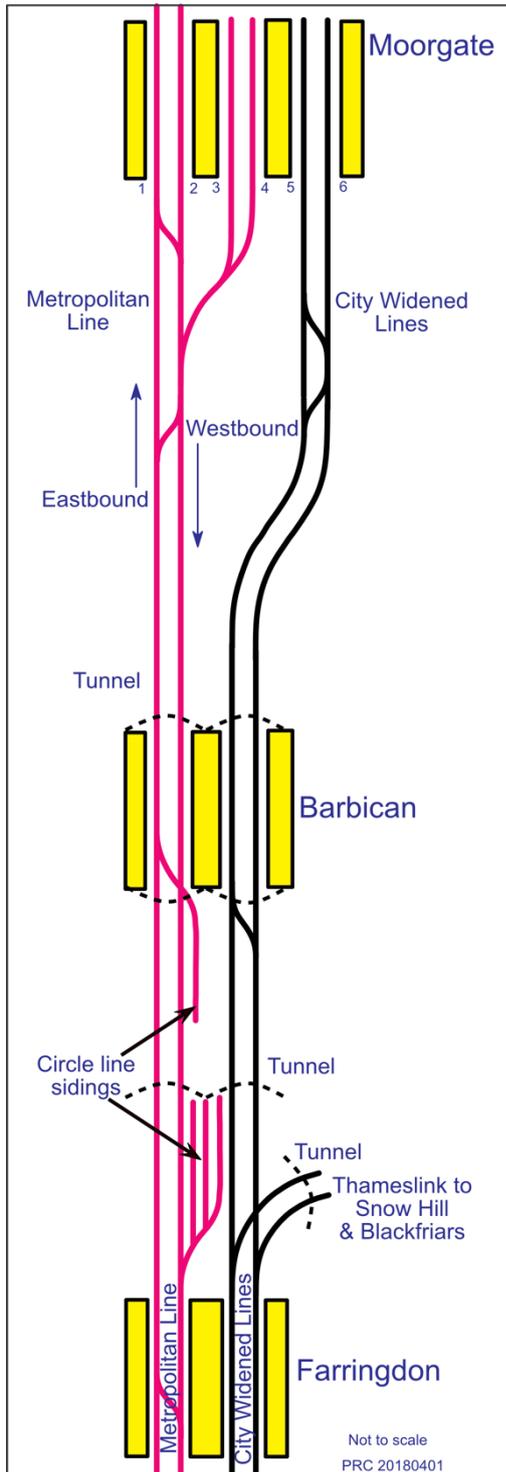


Figure 2: Schematic of the tracks between Farringdon and Moorgate from 1988 to 2009 showing the lines to Moorgate and the Thameslink route to Blackfriars.

Drawing: P. Connor.

Thameslink was extended through from Farringdon to Blackfriars to join up with the Southern Railway electric network. The Southern uses a 3-rail, 750 V DC system, different from both the Underground and the AC overhead systems. At Farringdon, the Southern's 3rd

A link from Farringdon southwards to Snow Hill was opened in 1866 to allow trains to run south towards Blackfriars and the Southern network. Passenger traffic worked over this link until 1916 and freight until 1969. The tracks were lifted in 1971.

Throughout this period, suburban trains continued to work over the CWL to Moorgate, where two terminal platforms were used by them.

Thameslink

In 1974, work started on electrifying the CWL on the 25kV AC overhead system as part of the so-called "Bedpan" scheme to electrify the Midland main line between St Pancras and Bedford. Electric trains began working on the CWL through to Moorgate on 15th July 1983.

In 1984, a scheme was proposed for the reopening of the link between Farringdon and Blackfriars via the Snow Hill tunnels so that passenger trains could run through from the Midland main line via the CWL to the Southern network (Figure 2). It was called Thameslink. Trains from the Midland main line began running through the tunnels on to the Southern network in May 1988. In March 2009, the CWL junction with Thameslink east of Farringdon was closed to allow Farringdon station platforms to be extended to accommodate 12-car trains. Barbican and Moorgate stations lost their main line service from this time and the tracks fell into disuse.

Infrastructure Changes to 2009

In reality, there were few changes to the main structures along the CWL until the addition of the overhead line supports and feeders for the 25kV AC electrification in 1983. The complications began with the electrical arrangements along the CWL section next to the Underground. This arose from the different electrification system used on the Underground – the 630 V DC 4-rail system. Requirements for protection against interference from the new AC system and the need to ensure signalling immunisation and safe bonding and earthing arrangements made for a complex project. Even the Underground's emergency traction current discharge arrangements had to be rearranged with special telephones provided along the tunnel walls of the Metropolitan line.

More electrical complications arose when Thameslink was extended through from Farringdon to Blackfriars to join up with the Southern Railway electric network. The Southern uses a 3-rail, 750 V DC system, different from both the Underground and the AC overhead systems. At Farringdon, the Southern's 3rd

rail system was extended into the station so that Thameslink trains could change over from one system to the other. Detailed surveys and extensive testing was carried out to ensure adequate electrical safety and protection covered all three systems. The bonding and

earthing arrangements were complex and expensive, particularly because it was a unique electrical environment and, to some extent because the station at Farringdon is a listed structure.

New Sidings for the Underground

When the former City Widened Lines between Farringdon and Moorgate were abandoned in 2009, the idea formed to use the tracks for the stabling of new Sub Surface stock – the S Stock. This stock was longer than the trains it replaced and there was to be an increase in fleet size. The original Circle line sidings at Farringdon and Barbican were too short for the new trains so four valuable stabling locations in Central London were lost. LU had to find 26 new stabling tracks for the S Stock around the system and the disused CWL tracks into Moorgate offered some valuable possible spaces.

There were several iterations of the idea before the current scheme (see diagram) was fixed and this diagram shows the arrangements that are due to be in service by May 2020. Work was due to start in March 2018 after completion of the works involved in the construction of the new Crossrail line below the site. Eight trains will be stabled on the old CWL tracks with the possibility of two more in Moorgate's Metropolitan line bay platforms Nos 3 & 4.

There were some problems to overcome. The first was that the two tracks were too long to be used as simple sidings. If the first train at the head of a queue of four or five trains at the Farringdon end failed during preparation for service, it would block in half the stabled trains. The solution was to install crossovers at strategic locations so that, at worst, only two trains would be affected by a failure. And, there is space for two additional emergency stabling berths at the Farringdon end of the tunnels.

The next problem was access. How would crews, technicians and cleaners get to the trains? Walking through the tunnels would not be safe with trains moving out of the sidings at regular intervals for the morning service. The answer is a clever deployment of trains so that at least one cab end of each stabled train is always accessible from one of the disused platforms, as shown in Figure 3. The arrangements allow for 7-car or 8-car trains, although the intention is that normally only 7-car trains will use the sidings.

Finally, there was the connection between the existing Metropolitan line and the old CWL tracks.

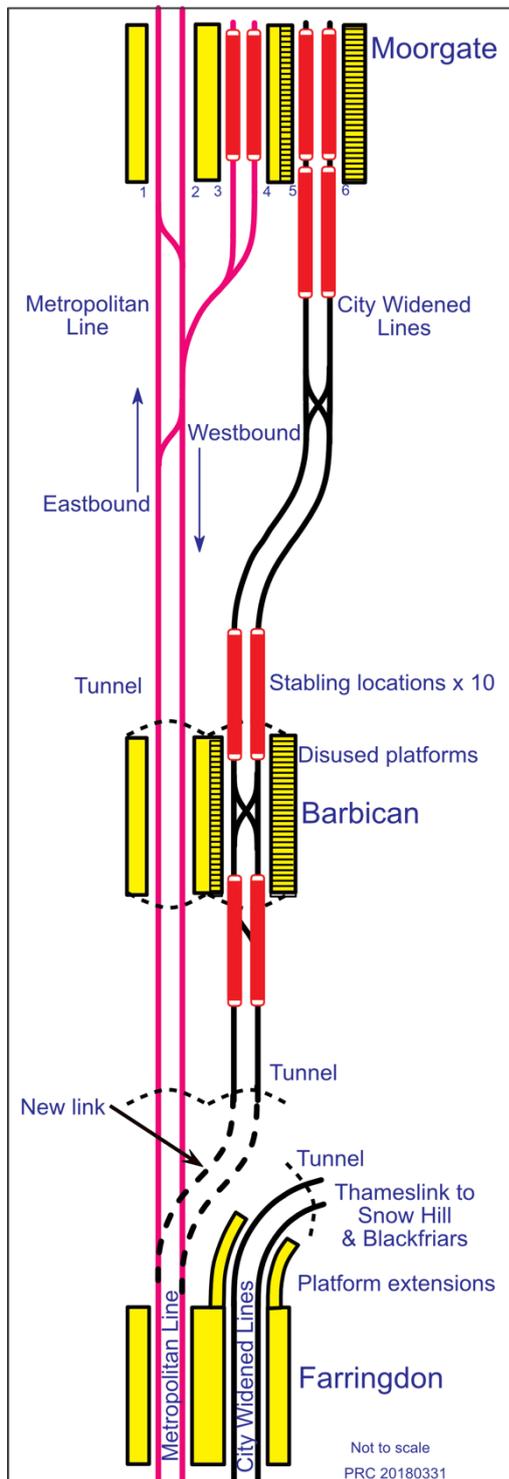


Figure 3: Schematic of the tracks between Farringdon and Moorgate with the proposed sidings using the lines between Farringdon and Moorgate. A new double junction will be installed to link the Metropolitan line with the former CWL tracks. Drawing: P. Connor.

The answer was the provision of a double flat junction and connecting tracks across the site of the former Circle line sidings at Farringdon. This, for me, seems the most difficult. The reverse curves and complex geometry of this solution suggest that speeds will be seriously restricted and will delay clearance for following trains. It is also intended to remove the existing crossover in Farringdon platform – so, here's your starter for 10: guess how you can get the eight trains stabled on the CWL without any reversals at Farringdon.

Summary

There are a number of interesting features to the recent City Widened Lines story and how it has developed. In summary:

- The physical structure of the CWL tunnels has changed very little;
- The overhead AC electrification brought special problems because of its proximity to the Underground's DC system;
- Further electrical problems arose with the joining of Thameslink with the Southern's DC network, requiring special measures at Farringdon;
- The loss of the connection between Thameslink and Moorgate created an opportunity for London Underground in their search for additional stabling space;
- The train locations needed special consideration to provide a reliable route for all trains going into service;
- Train locations also had to allow safe access for crews, technicians and cleaners.

Additional work would have to be considered to provide lighting, traction current, evacuation systems, storage, messing facilities, toilets and data management systems. Perhaps some of these facilities would be available at the stations but the trains are spread over 700m. How will staff move from one to another? Finally, secure protection from public access must be provided but allowing 24-hours access for staff.

The new sidings idea was originally thought to be a simple project but, as we have seen, it proved to be far more complex and to require a number of special considerations before it will be completed.