



Thameslink Programme Electrification & Signalling Interface Issues

Martin Sigrist – Principal Design Engineer (E&P)

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Content

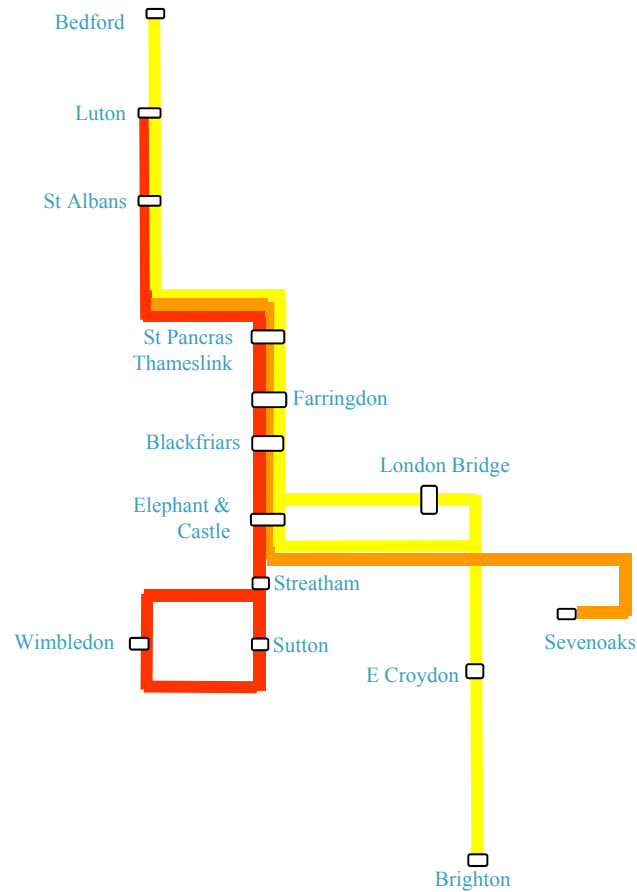
- Introduction
- What is Thameslink
- Outline of Electrification on Thameslink
- Dual Electrification
- Autotransformer System
- Earthing and Bonding

What is Thameslink

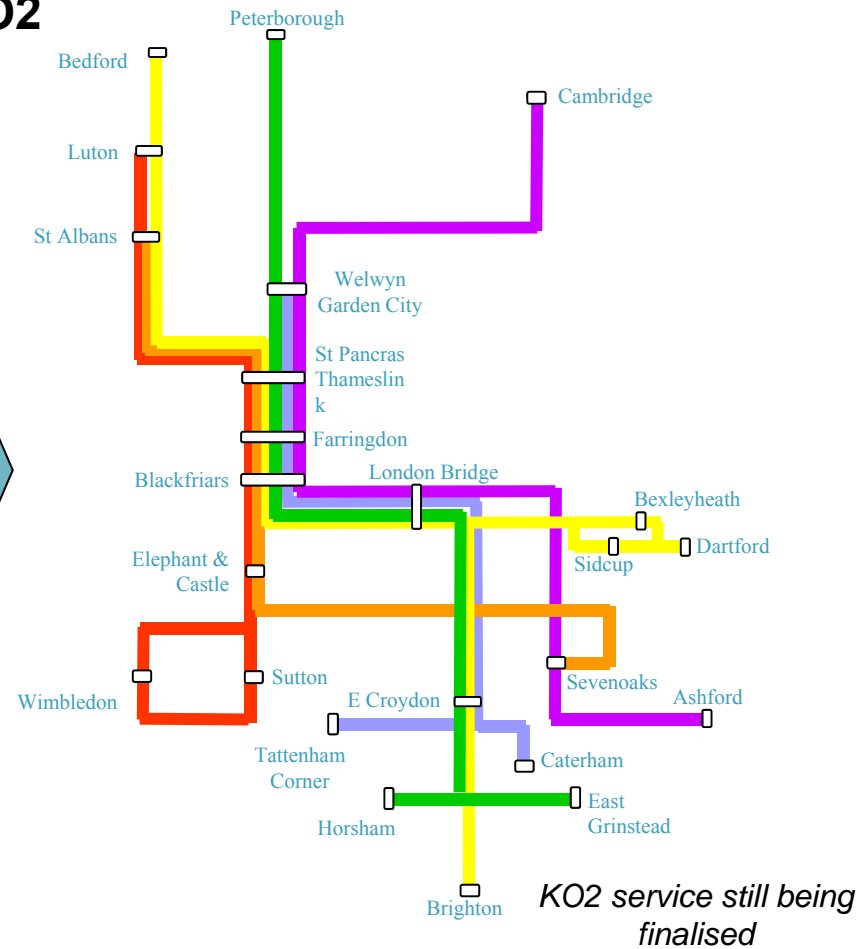
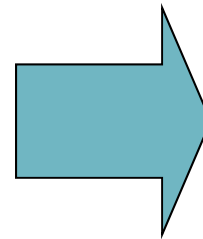
- Thameslink Programme high level requirements for the route (s)
 - 12 car trains
 - 24 trains an hour (in each direction) within the Core Area
 - Including up to 32 TPH in perturbation recovery
- E&P Requirements
 - Electrification system capable of feeding the above
 - Initial scope developed in 90's under Thameslink 2000, but developed further under the current scheme

What is Thameslink

Initial service pattern



Final Service pattern post-KO2



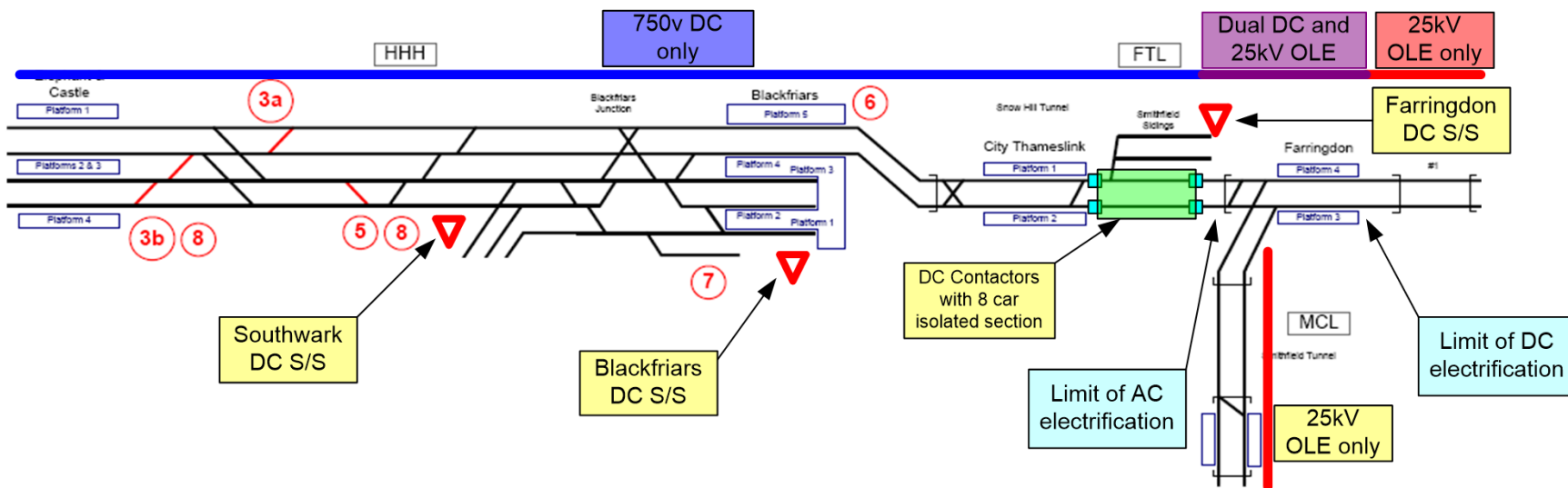
Electrification on TLP

- The original system design identified a number of upgrades to both the AC and DC Systems, this mainly comprised of:
 - 25kV Traction Enhancement on the MML due low volts at City Thameslink under outage (N-1)
 - 750V DC System upgrades at know weak areas and for equipment overloading under outage (N-1)
 - Extension of the Dual Electrified Area between Farringdon and City Thameslink, driven by operational requirements

Dual Electrified Area

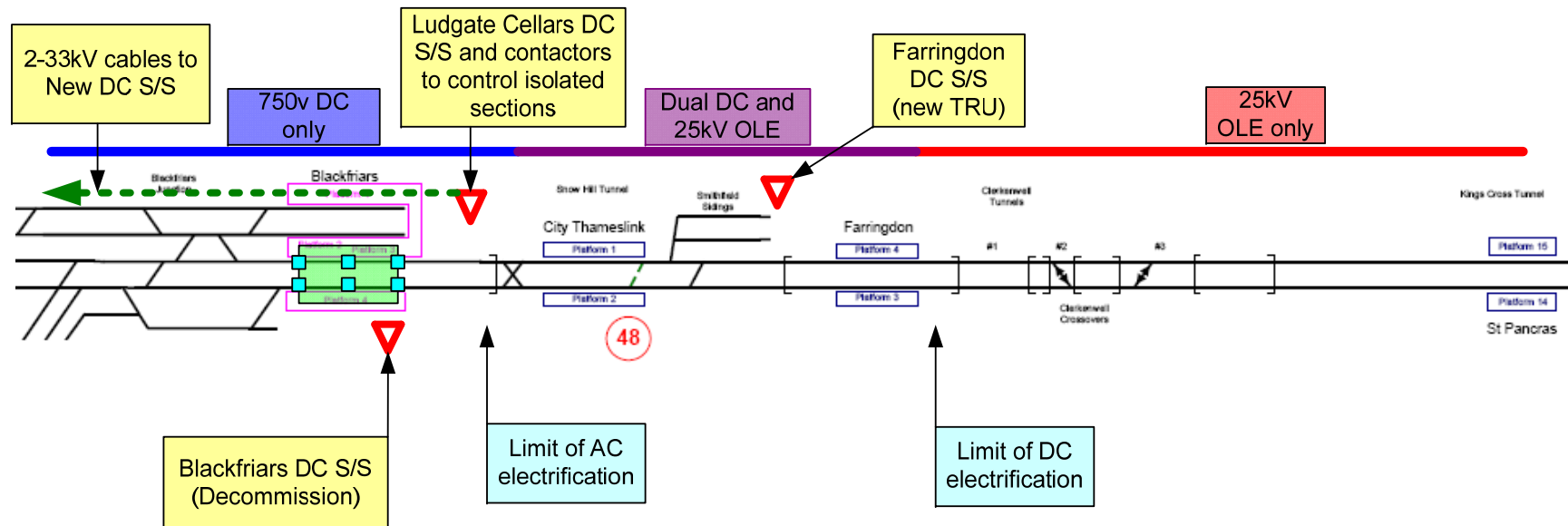
Dual Electrified Area

- Old Layout between Farringdon and Blackfriars with an 8 Car Contactor Section



Dual Electrified Area

- New layout between Farringdon and Blackfriars with an extended DEA and 12 Car Contactor Section

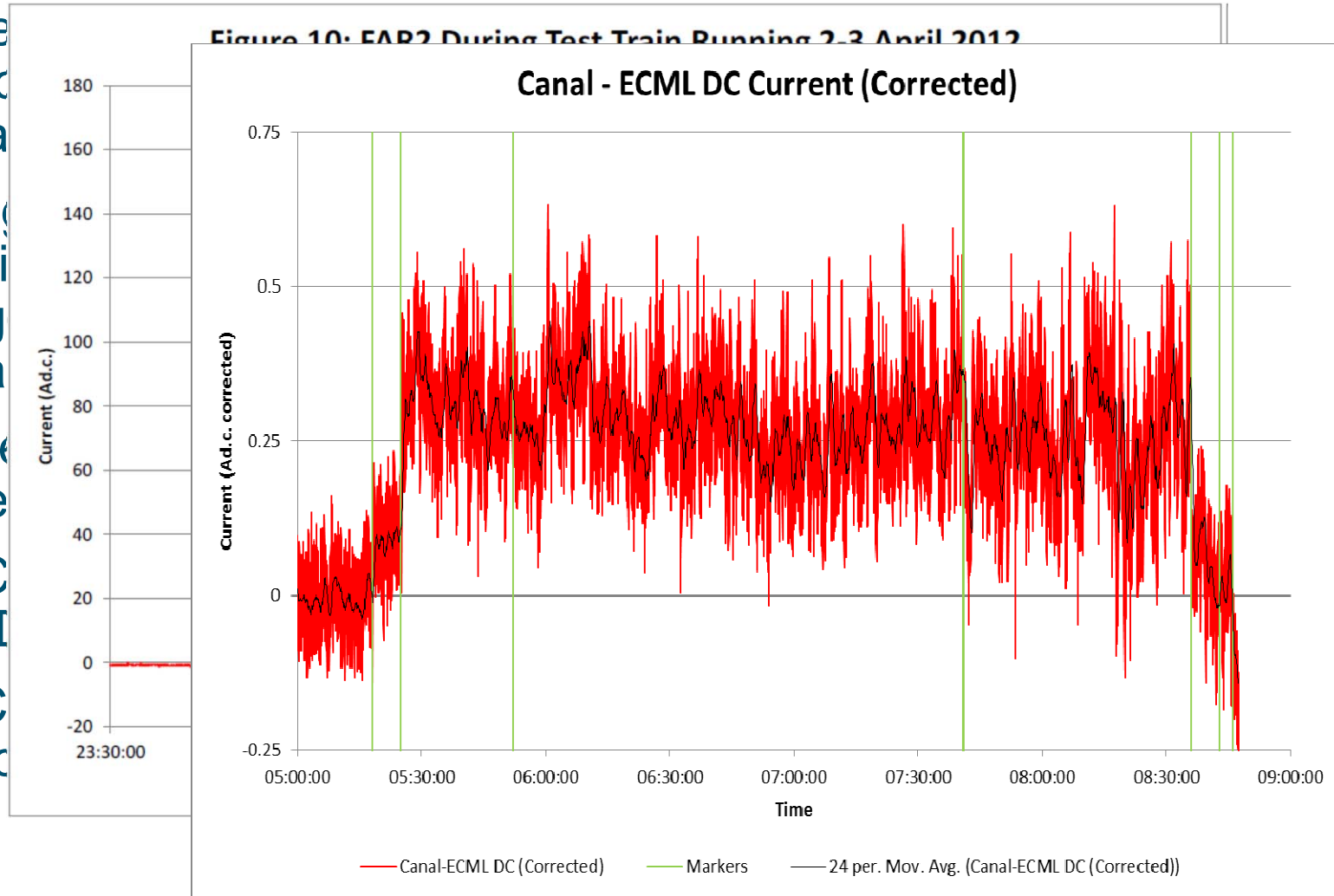


Dual Electrified Area

- Issues arising:
 - Design choice of track circuits – single or double
 - Stray currents both AC and DC – effects to track circuits
 - DC Stray currents – corrosion
 - Track circuit reliability – new issue following commissioning was IRJ Arcing

Dual Electrified Area

- Further stray current at interface
- Testing the drift change time constant
- An interface will be
 - DC to DC
 - AC to AC



Resolving Issues - Examples on TLP

- IRJ Arcing?
- Not considered or known about during the initial design
- Currently being monitored and assessed
- Four solutions being investigated, including arc diverters and contactors installed closer to the IRJ
- Arc Diverter in Operation



Resolving Issues - Examples on TLP

- What happens to IRJ arcing when cables are shorten?

Before



After

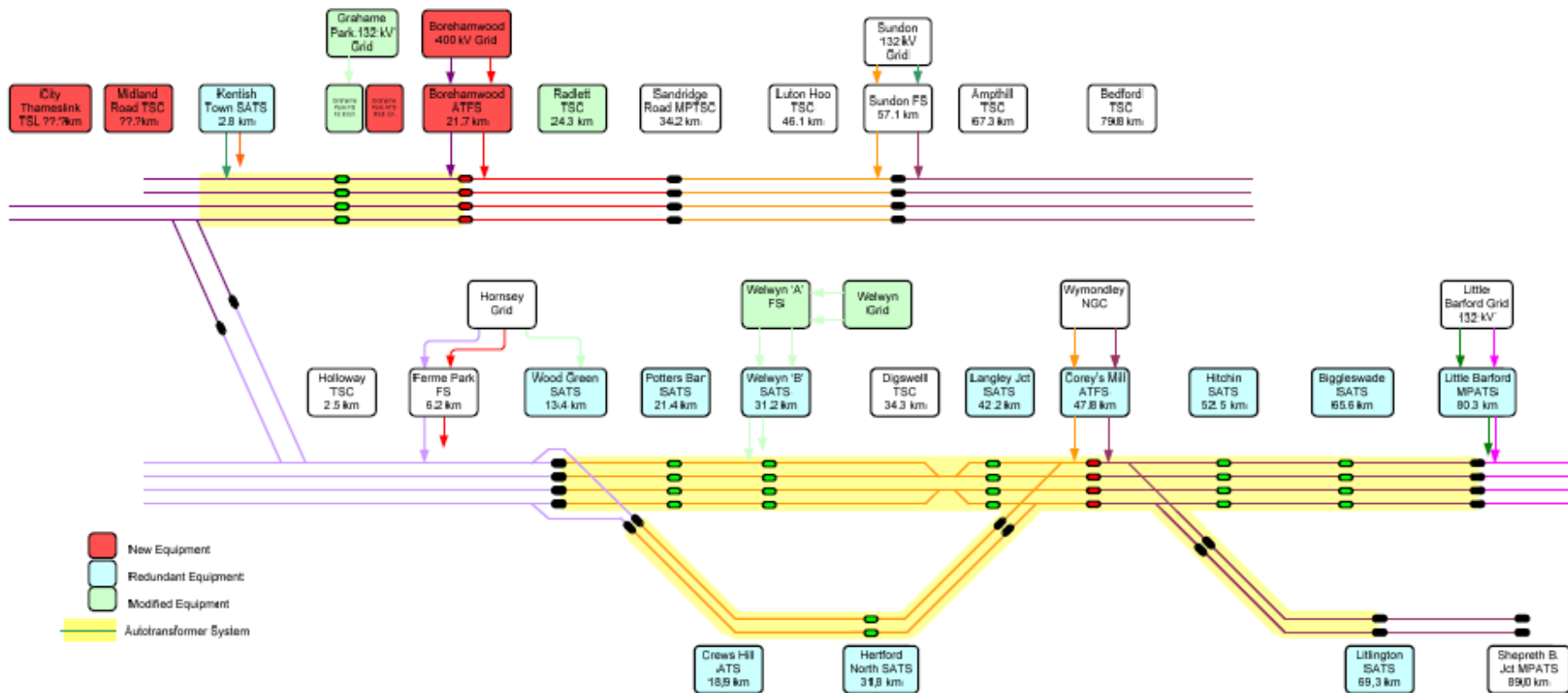




Autotransformer Upgrade on MML

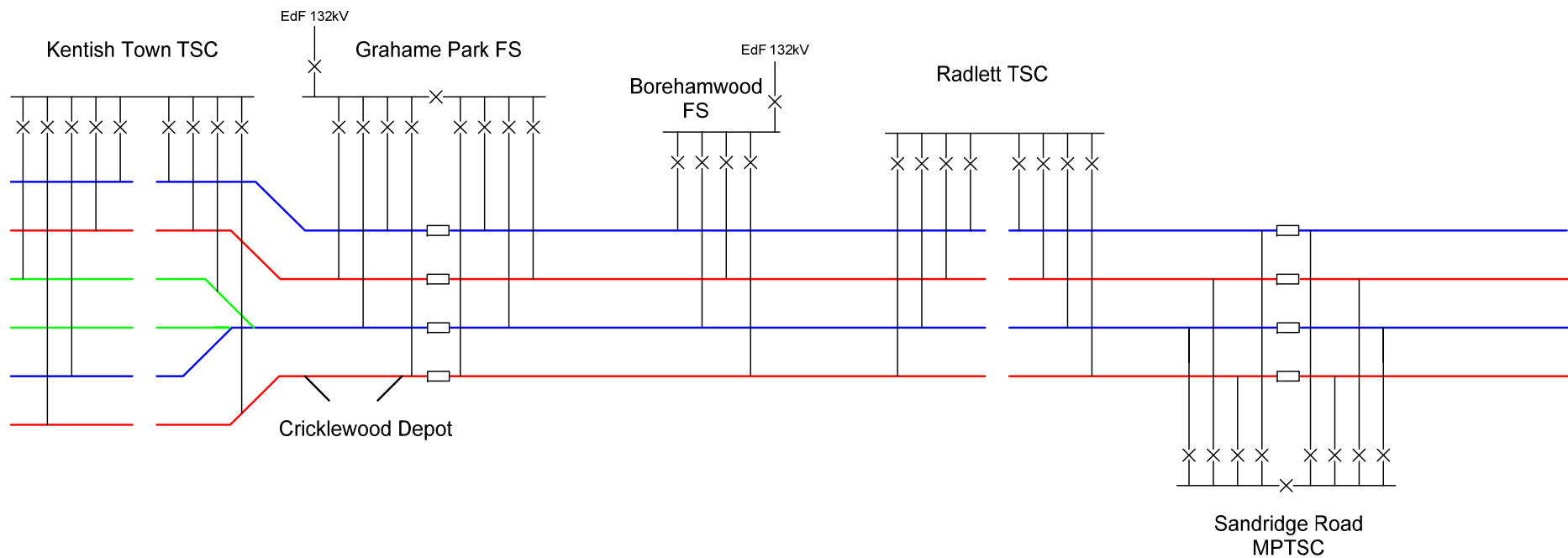
AT Upgrade on MML

- The original Thameslink 2000 concept removed Regents Canal FS at St Pancras and added AT on MML and ECML (WIP?)



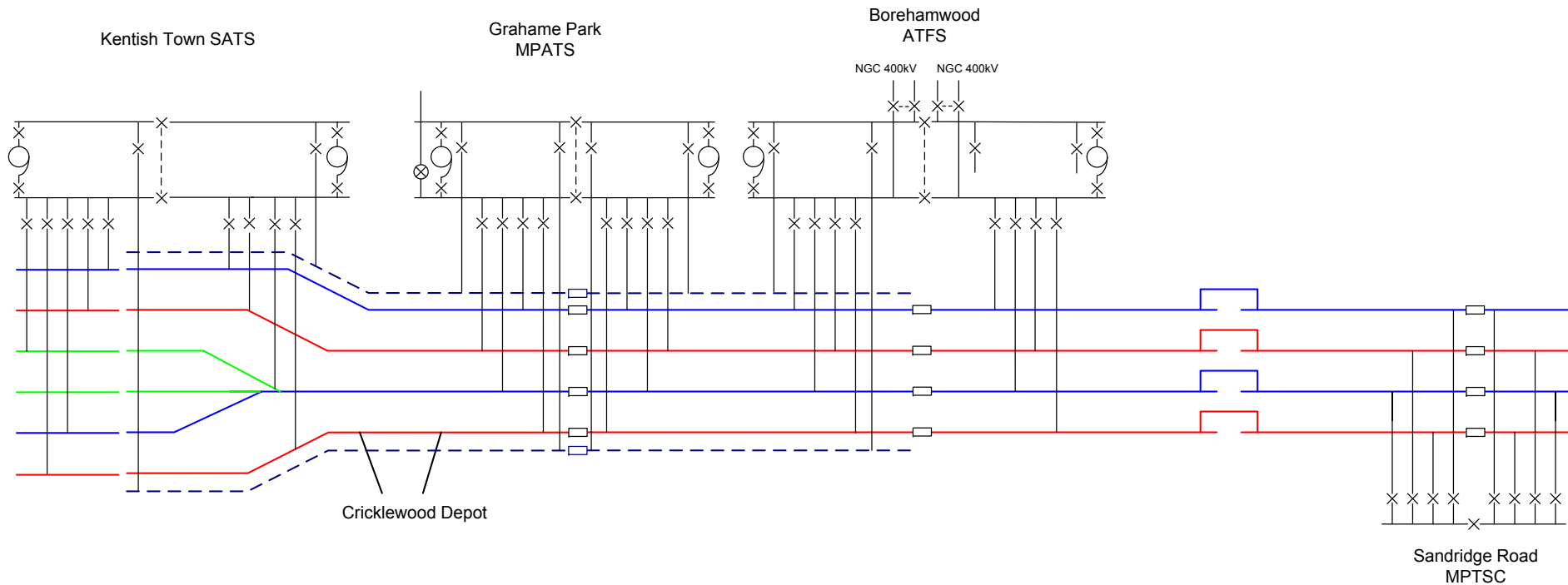
AT Upgrade on MML

- Overview of the 25kV Classic fed system on the MML, with convention bonding



AT Upgrade on MML

- Overview of the TLP Autotransformer Upgrade Scheme on the MML, which required enhanced bonding over the complete length

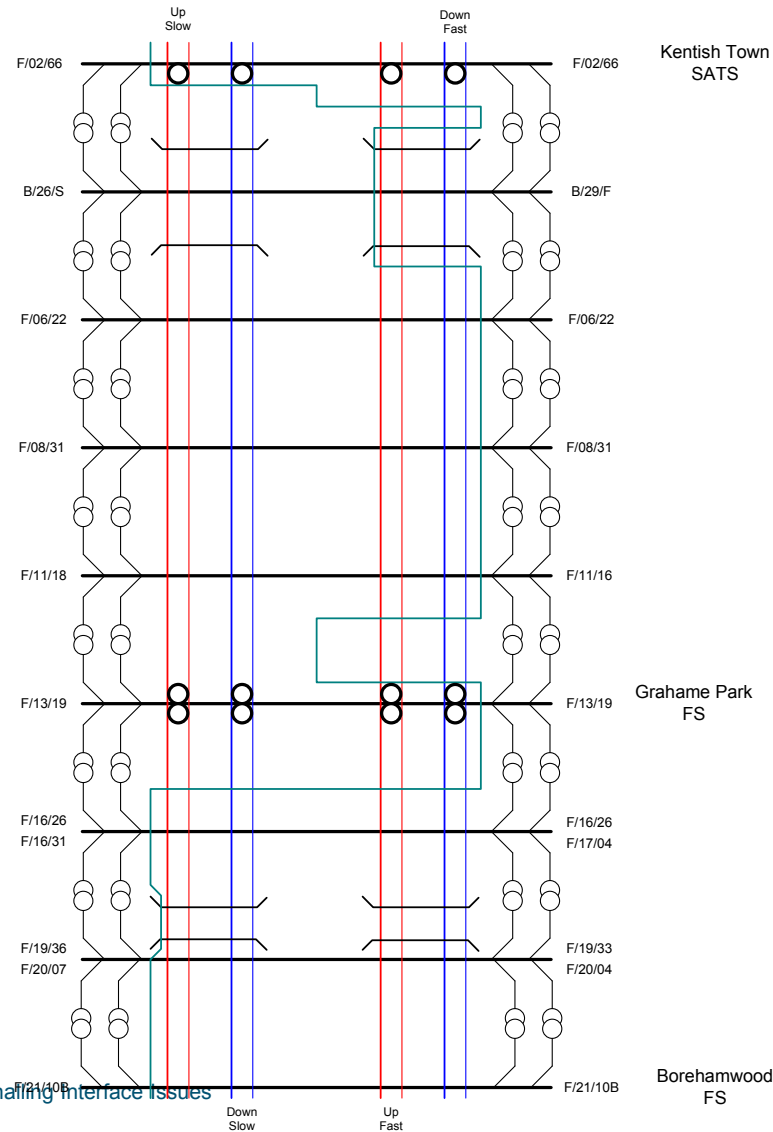


Autotransformer Staging

- The Thameslink Autotransformer installation was broken down into 7 key stages, these are:
 - Stage 1 = Install Return Screen Conductor (RSC) & additional Cross Track Bonding (XTB)
 - Stage 2 = Switchgear Renewal
 - Stage 3 = Remove BT/RC System
 - Stage 4 = 1st National Grid (NG) feed installed and commissioned
 - Stage 5 = Borehamwood neutral section
 - Stage 6 = Full AT System
 - Stage 7 = 2nd NG feed installed and commissioned

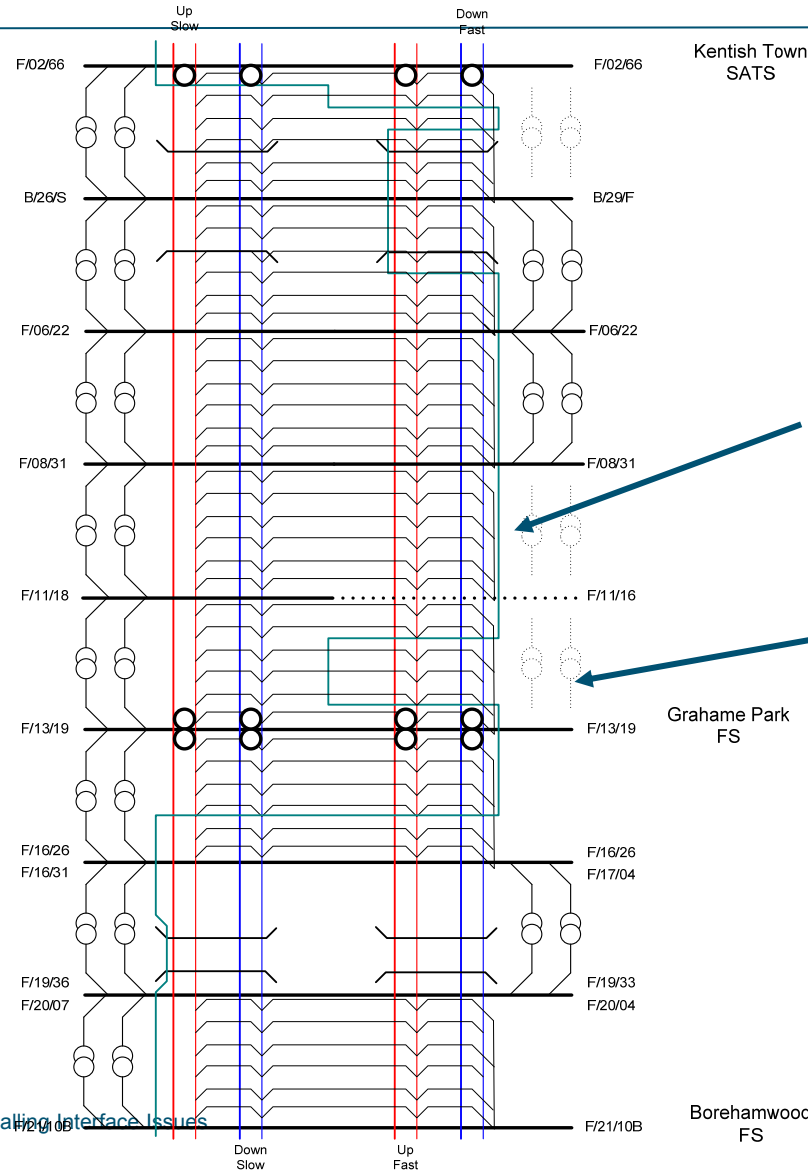
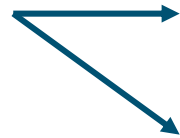
Basic Conversion from.....

Example of how the BT/RC system was converted to a Rail Return with RSC

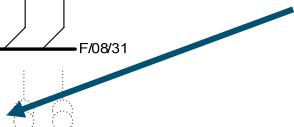


Via.....

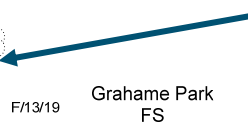
Each section defined between Mid-Point Connections (MPCs)



Additional Cross Track Bonding and RSC



Removal of Booster Transformers

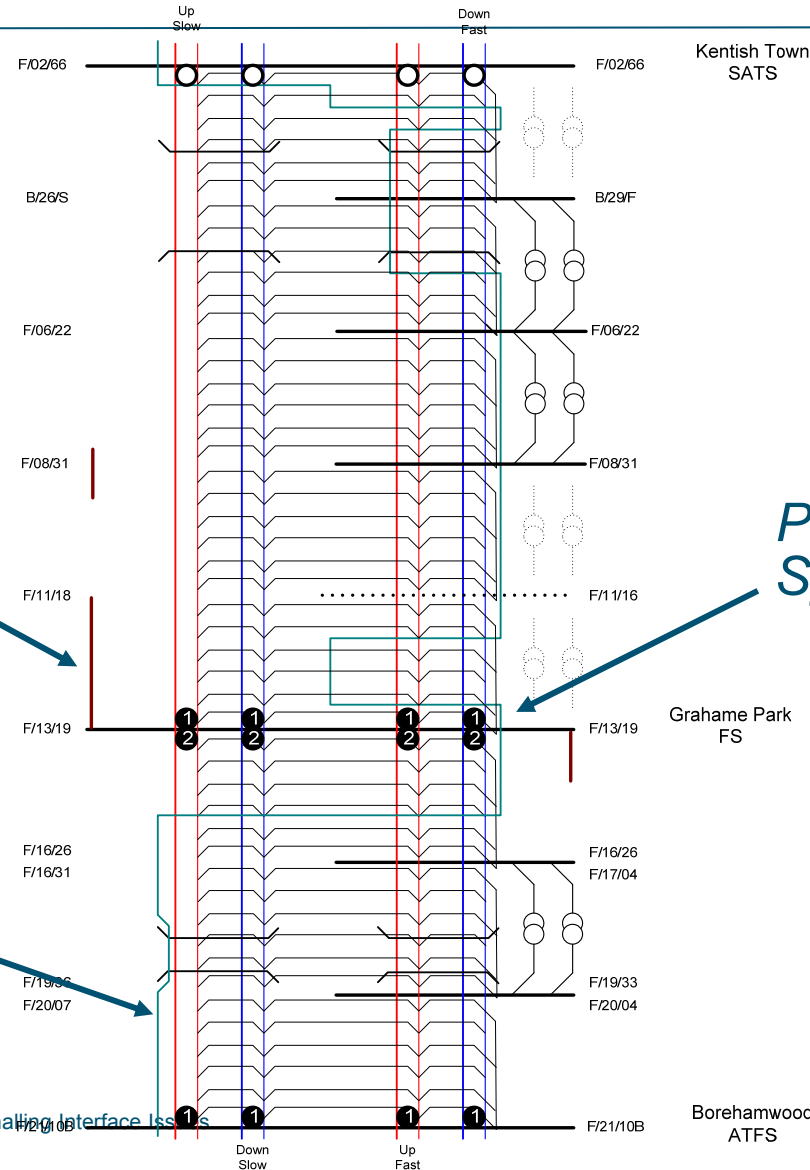


And.....

Installation of AT Aerial Feeder

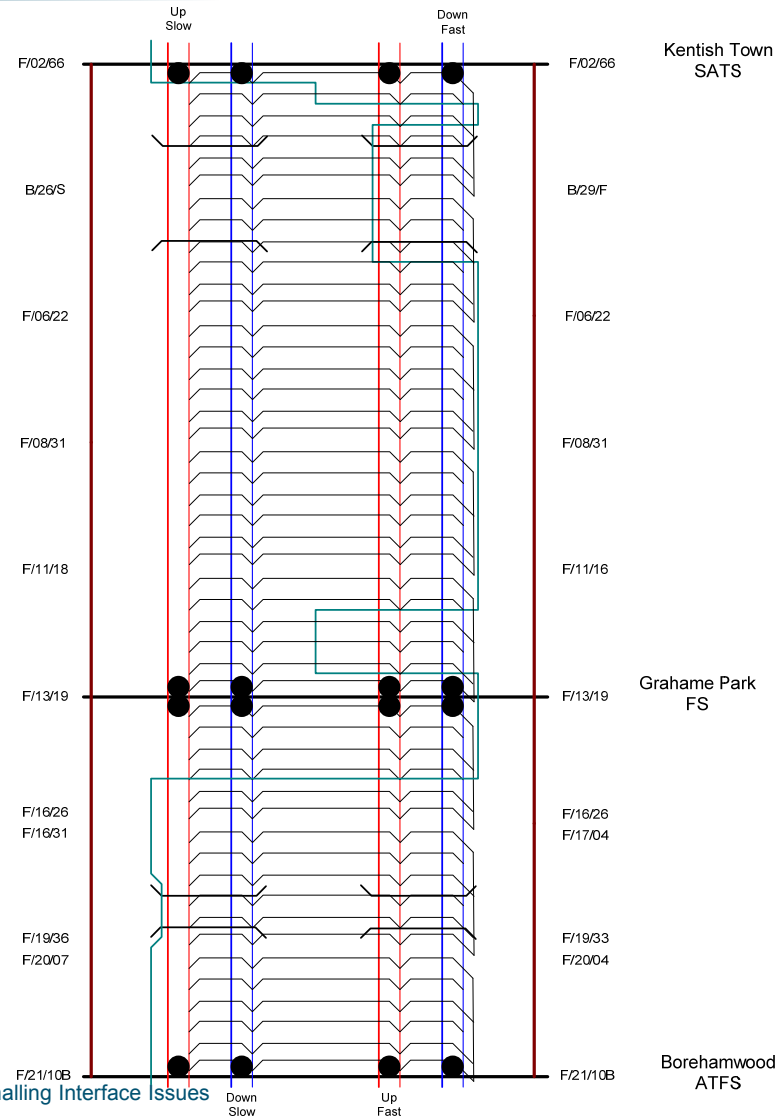
Protection System Changed

Shows route of Telecoms cable that needs to be immunised



To.....

Completed conversion from BT/RC to RSC/ATF



AT Upgrade on MML

- Issues arising:
 - Track circuit reliability – Implementation of enhanced bonding causing track circuit failures and bonding failures
 - AT Safety Case – effects of AT system on track circuits considered various scenarios inc AC Immunisation at Blackfriars (via the DEA) and levels on DC components of AT transformer inrush. All of these are now included in the Generic Electrification Safety Case

AT Upgrade on MML

- Grahame Park bonding failure caused by Grid transformer failure at Borehamwood - operational issues in service reduction



Earthing and Bonding

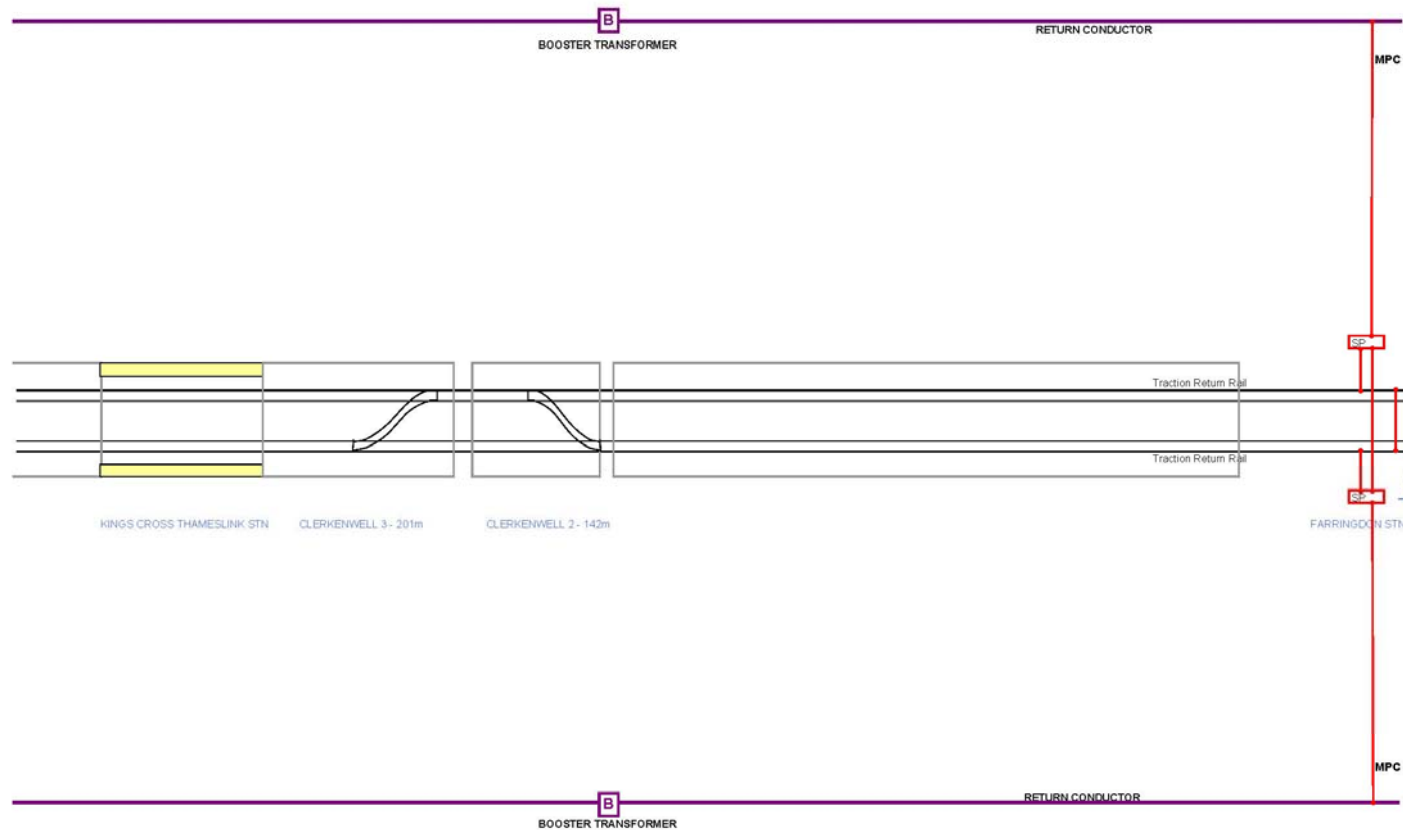
Chris Wilson

E&B Issues (1)

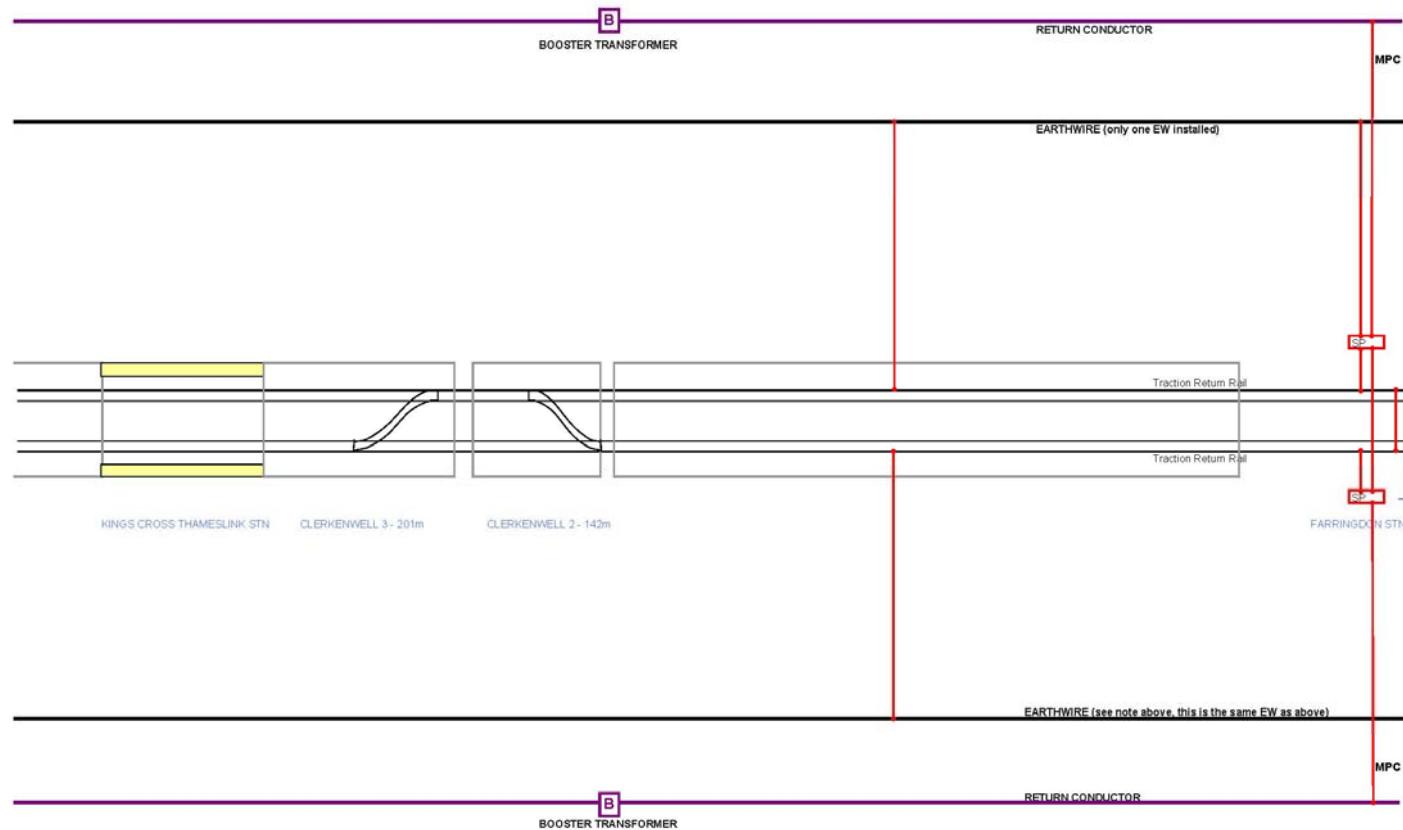
- Earthing and Bonding Issues in the Core Area
 - Recent issues found currently being investigated
 - The design of not just Electrification and Signalling disciplines needed
 - Failure to understand the E&B completely could present track circuit reliability issues

- An example of the Thameslink Core Area – the Clerkenwell Tunnels

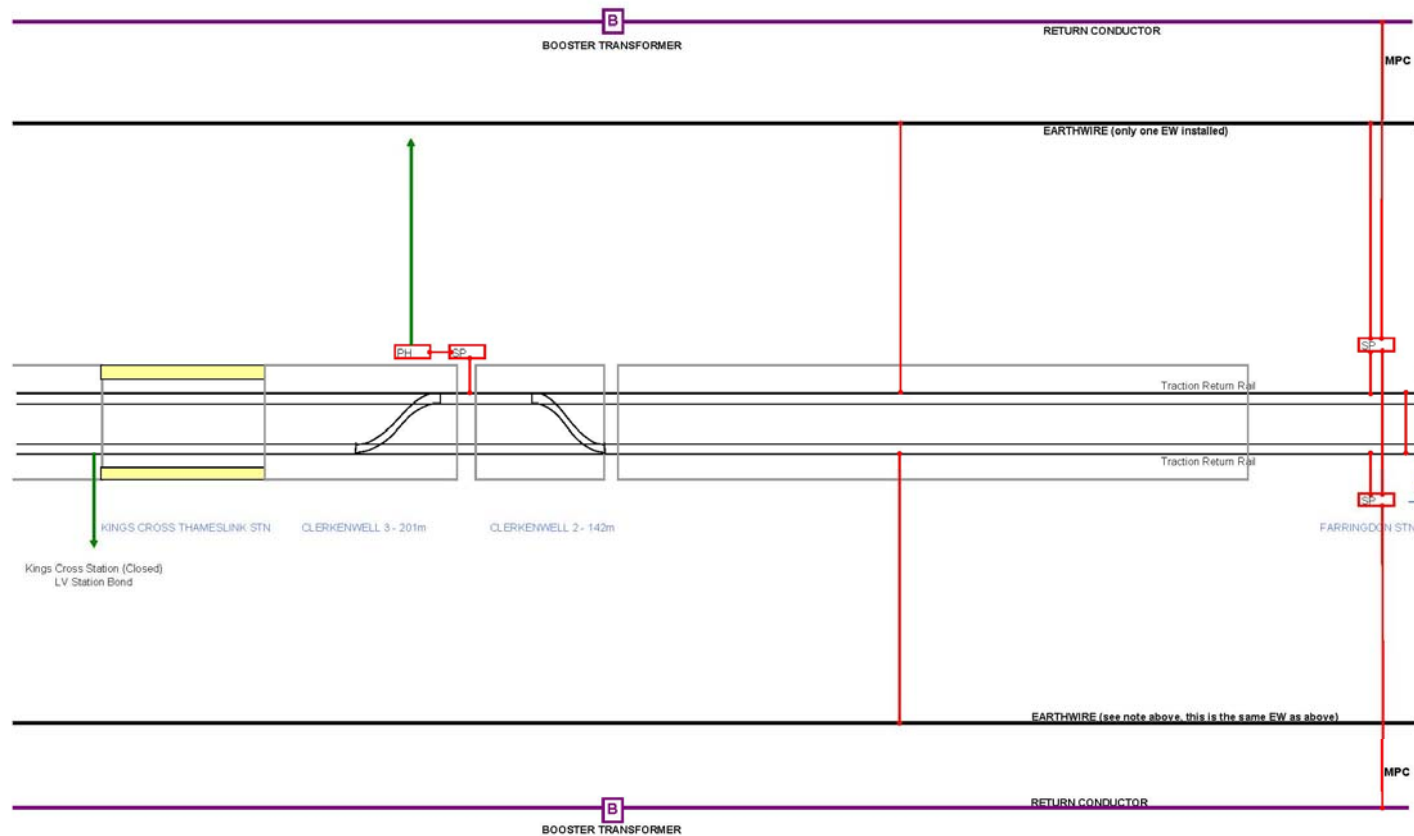
E&B Issues (2) – TRR and RC



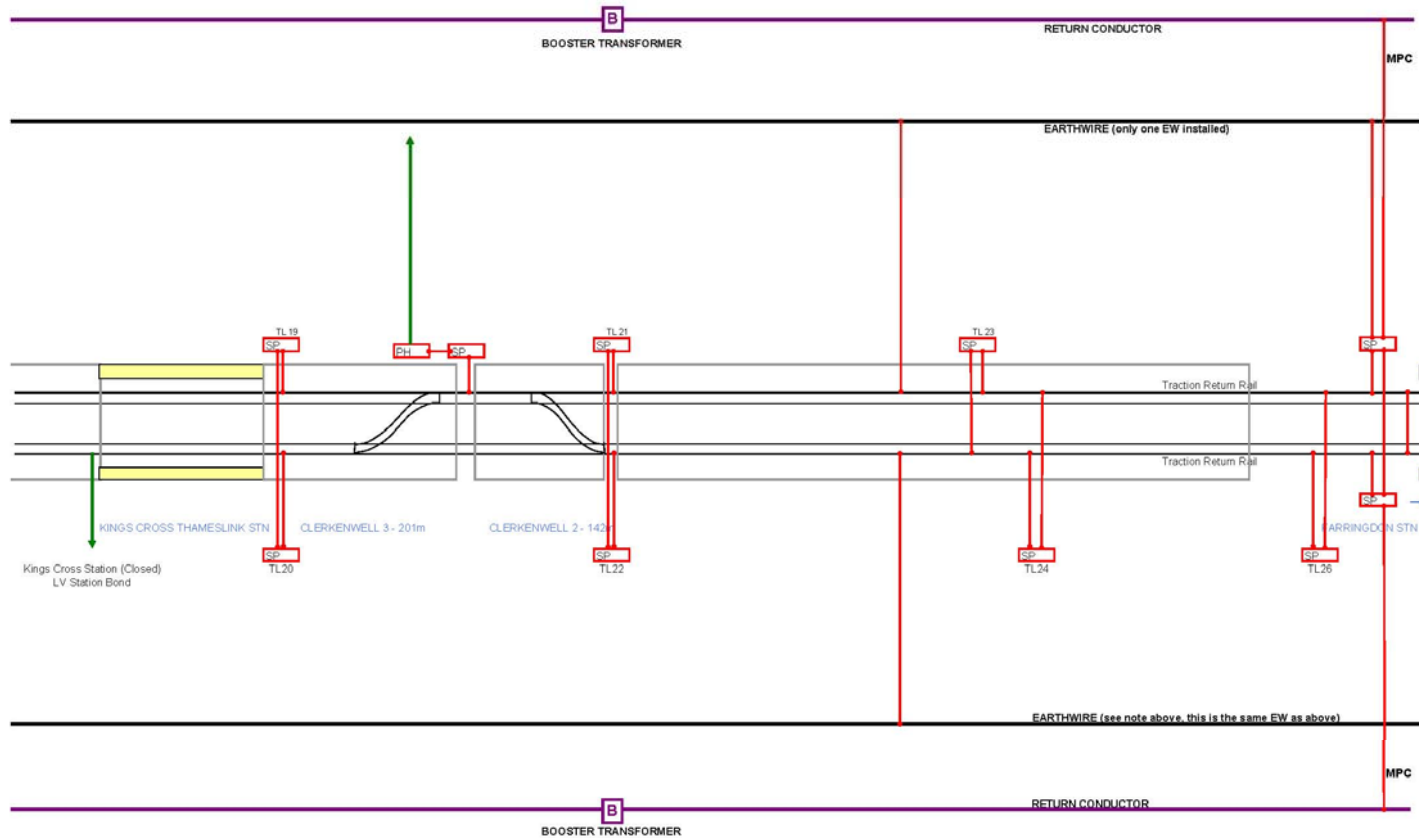
E&B Issues (3) – Add EW



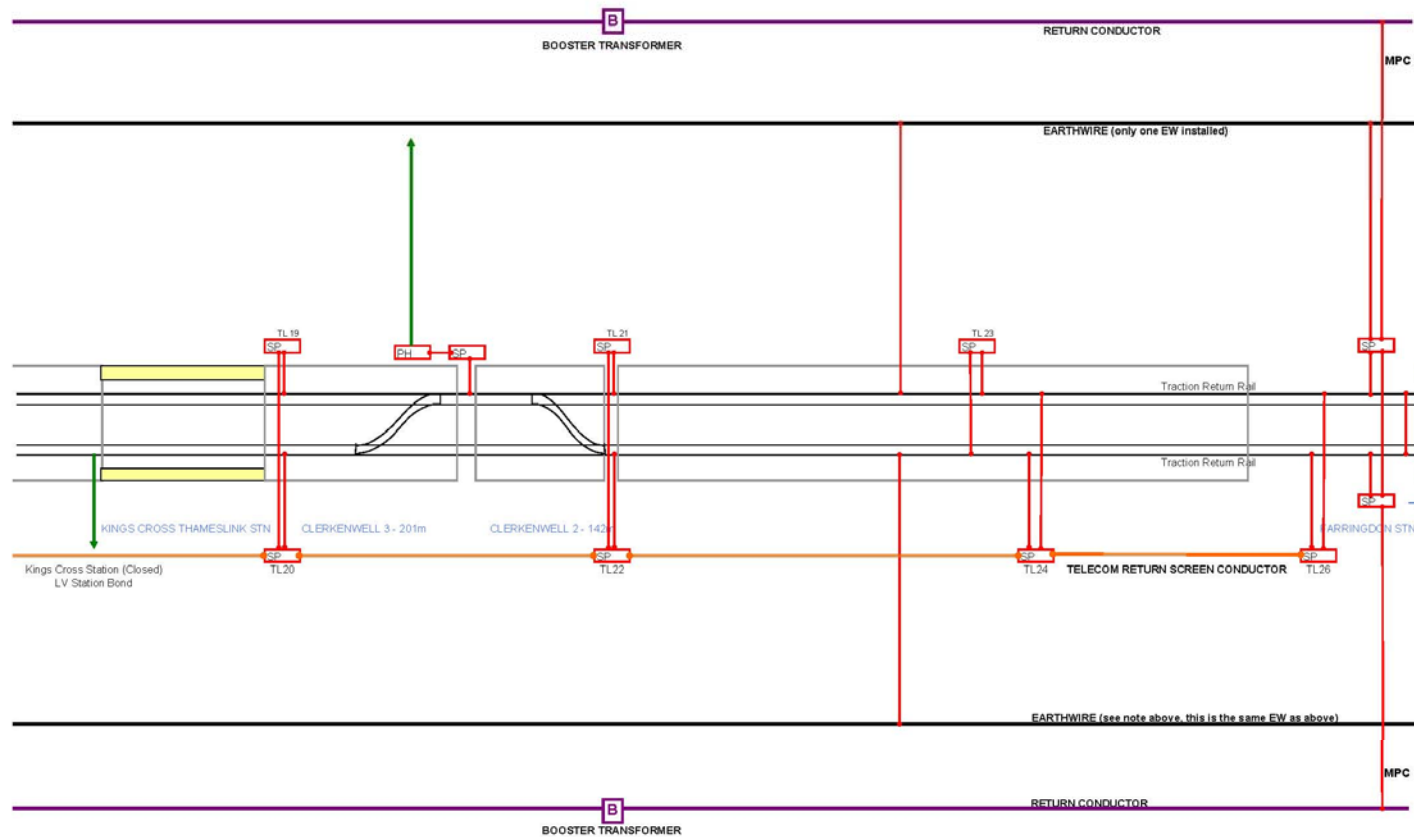
E&B Issues (4) – Station Earths



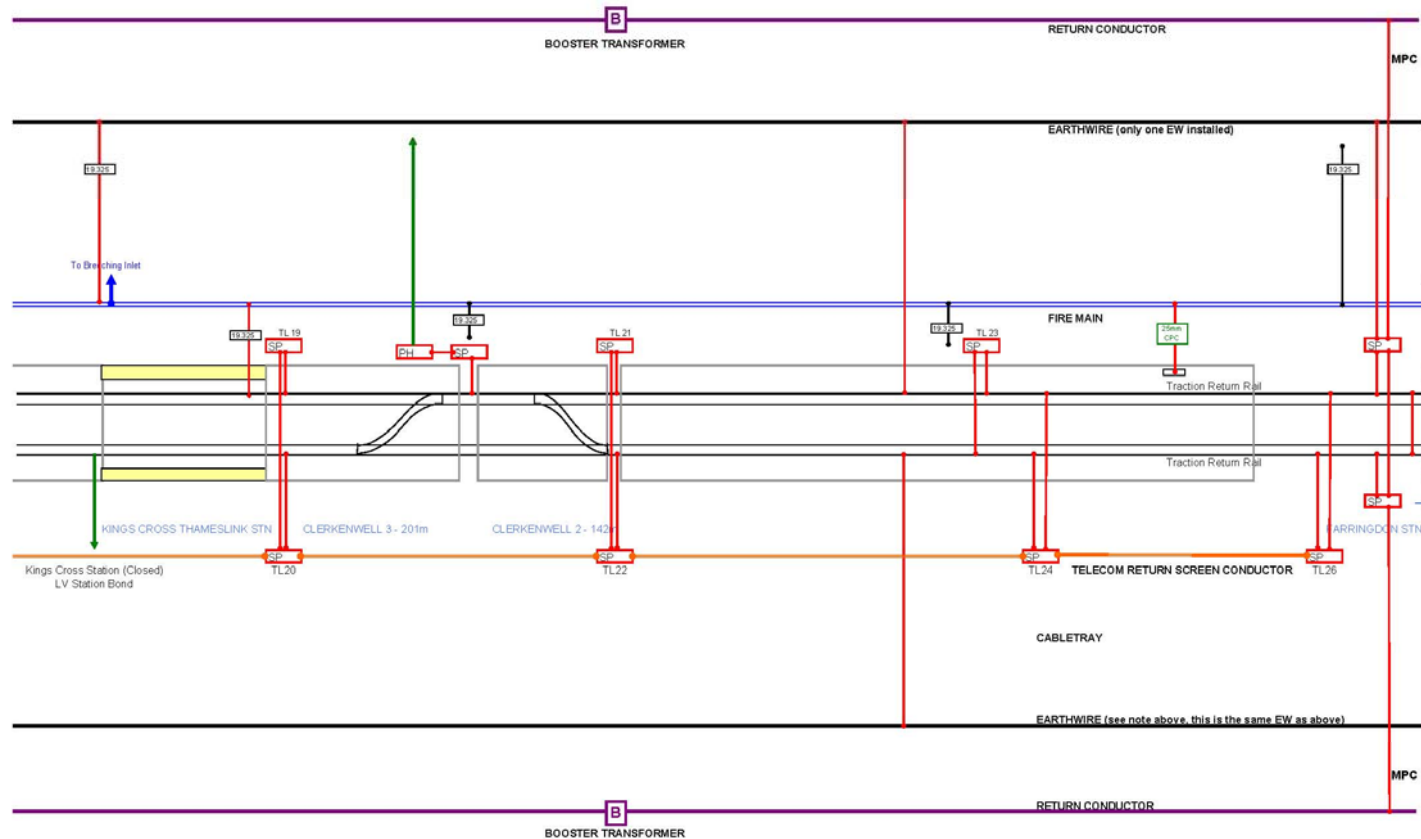
E&B Issues (5) – FSP Earthing



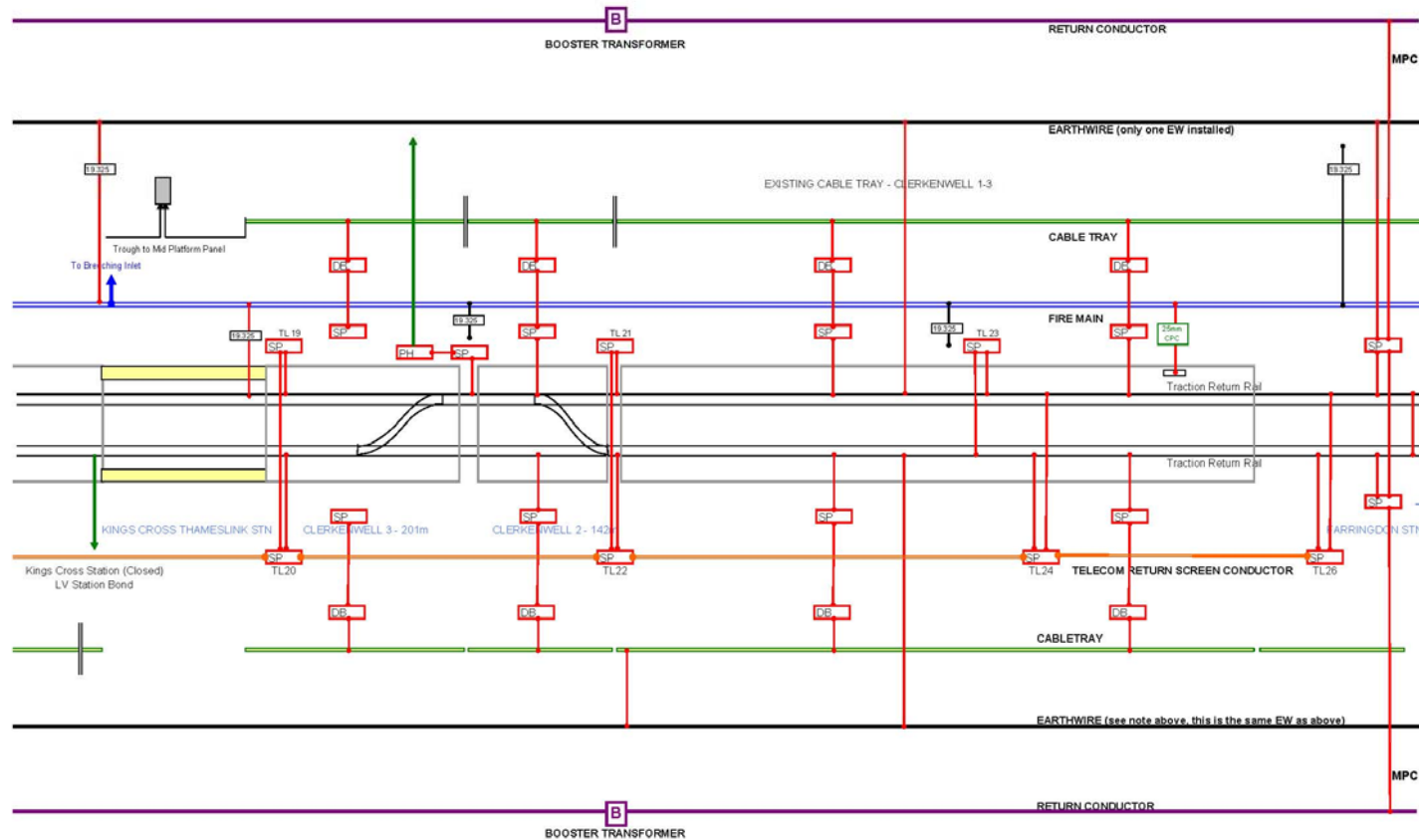
E&B Issues (6) – Telecoms RSC



E&B Issues (7) – Fire Main



E&B Issues (8) – Cable Tray



E&B Issues (9)

- TLP
- tr
- E



Any Questions?