



Managing High Speed Track

Andy Vickerstaff, Head of High-Speed Engineering [Track]



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 - HS1 Basics
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HS1 Eco System



Network Rail High Speed



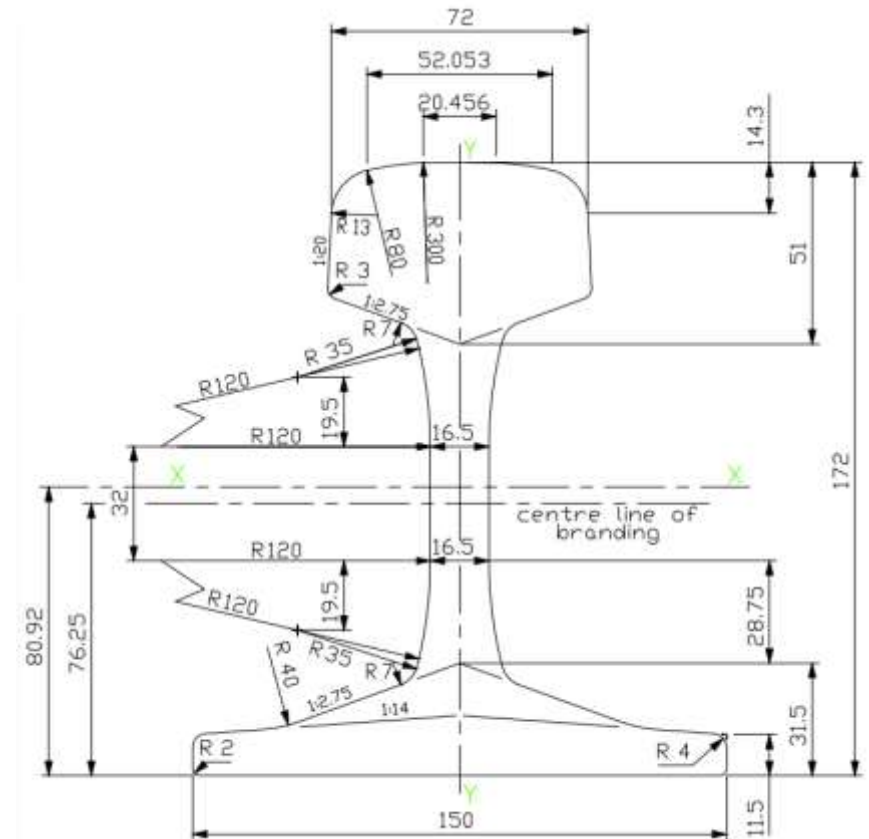
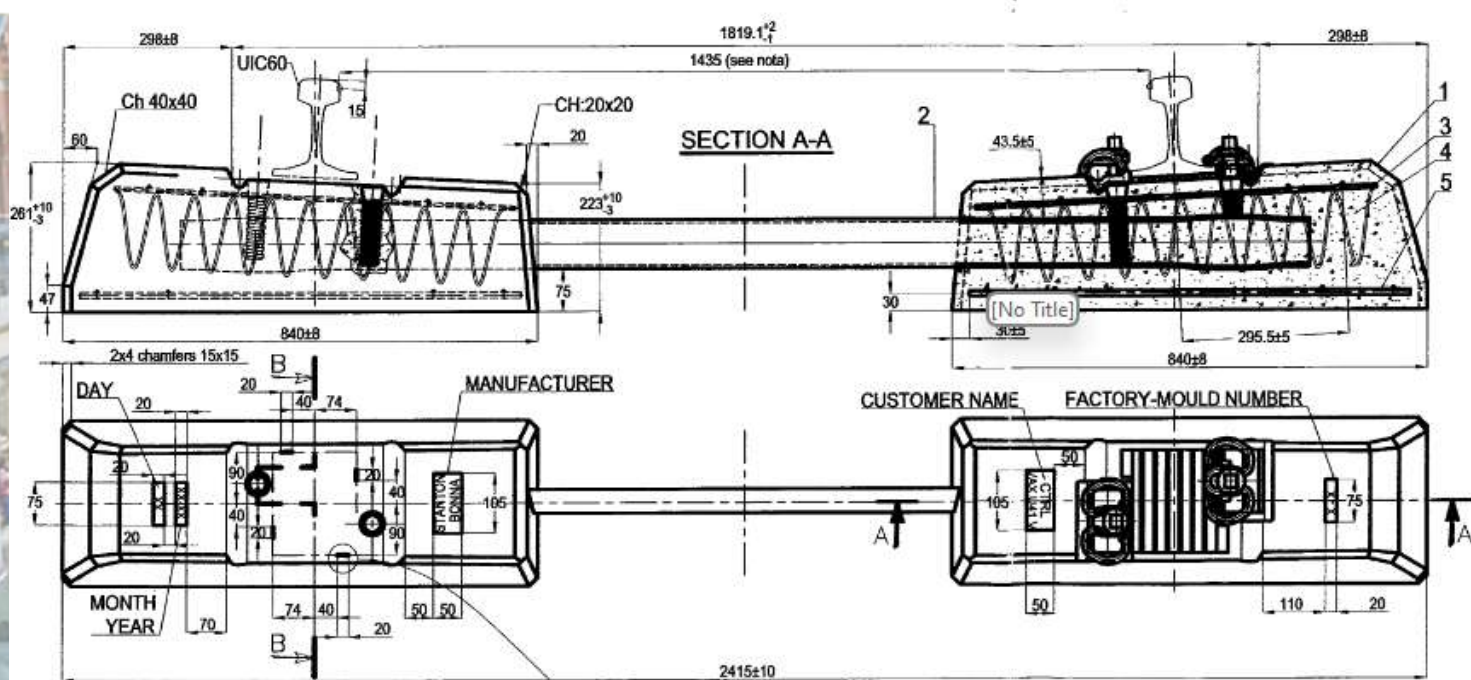
HS1 Basics: The Route



- 109 Kilometres (OKP St Pancras)
- Max Speed 300kph (180mph)
- 4 Stations (3 NRHS Managed)
- Class 395 (Domestic)
- Class 373/374 (International)
- UIC GC Freight 140kph
- UCI GB1 Passenger 300kph
- 79 NR60 Switches
- 62 High Speed Vossloh Swing Nose

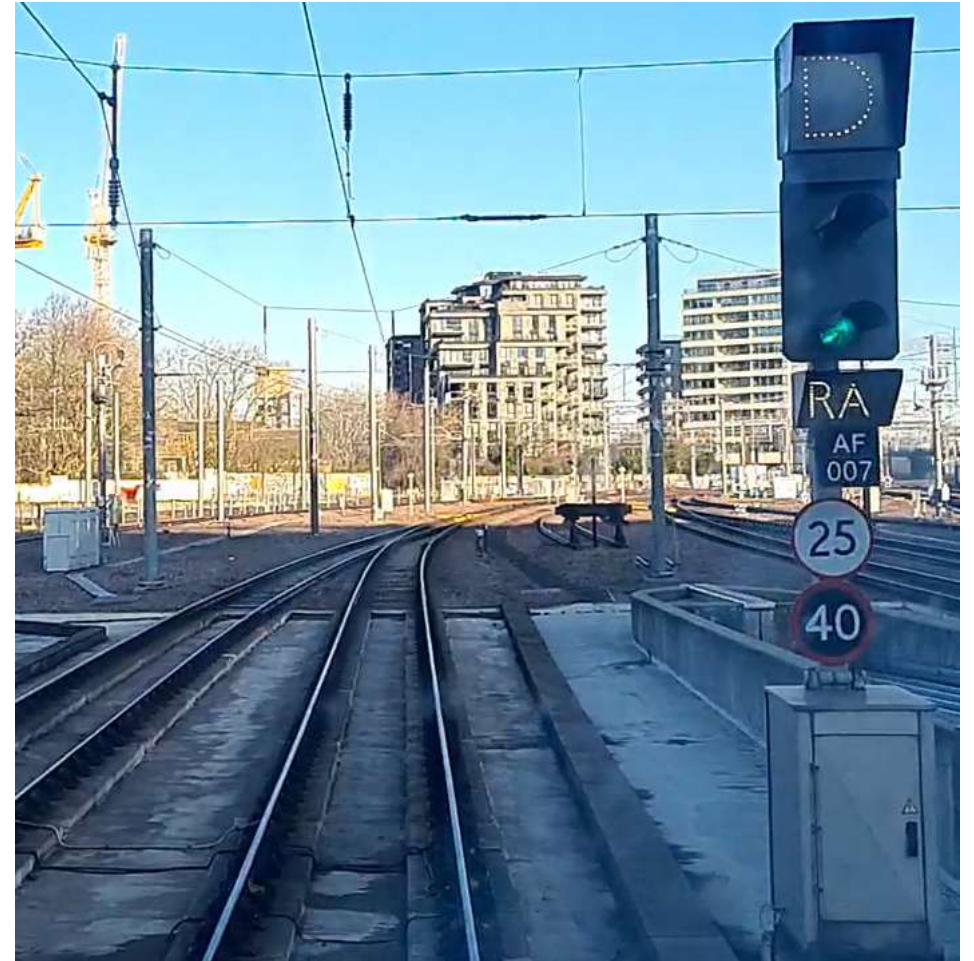
HS1 Basics: The Permanent Way





Contrôle de vitesse par balises (KVB)

- St Pancras & Ebbsfleet High Level
- Fixed Colour Aspects
- AWS/TPWS
- KVB ATP
- 6 Hole Glued IBJ's

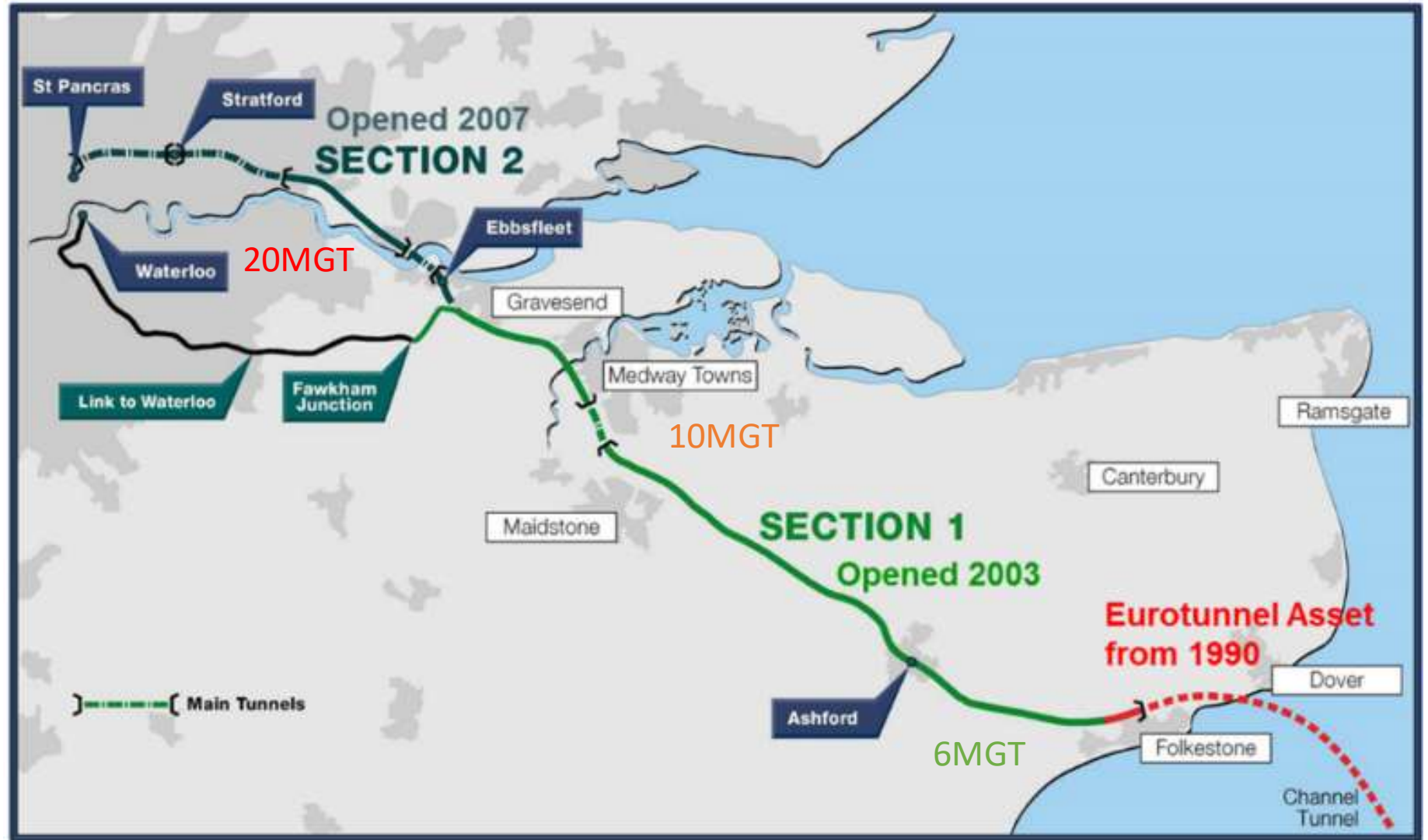


Transmission voie-machine (TVM430)

- 1500m Blocks (300kph) / 950m (230kph)
- Bi-Directional

	Steady line speed indication for normal running (white characters on green background): the displayed speed is the maximum operating line speed
	Flashing line speed indication for normal running it indicates that the next block section requires a decrease in speed denoted by a lower speed band display
	Steady announcement indication for a speed restriction (black characters on white diamonds on a black background): the driver must comply with the speed displayed as soon as possible
	Flashing announcement indication for a speed restriction ; the driver must comply with the speed displayed as soon as possible. The display indicates that the next block section also requires a decrease in speed denoted by a lower speed band display
	Steady execute indication for a speed restriction (white characters on a black background): this display indicates to the driver the speed he must not exceed within the current block section
	Flashing execute indication for a speed restriction displays to the driver the speed he must not exceed within the current block section. The next block section will also require a decrease in speed denoted by a lower speed band display
	Stop indication (black characters on white diamonds on a red background): the driver must stop at the next absolute stop or stop and proceed marker or signal encountered
	Proceed on sight indication (three red squares) is normally displayed after a stopping sequence when an authority to pass a closed marker or a signal at danger has been given. It is also displayed when the track-to-train transmission has failed. The driver is required to stop short of any obstruction or at the next absolute stop or stop and proceed marker. The driver is allowed to proceed within the block section where this indication is displayed at a maximum speed of 30 km/h





Basic Visual Inspections

Ref:	C-03-TK-35-2002
Issue:	3.0
Date:	17 th January 2023
Compliance date:	1 st March 2023

Table 1 – Minimum Frequency of Plain Line Visual Track Inspection

Activity	Method	Nominal Interval (Weeks)	Maximum Interval (Weeks)	By	Comments
Level 1 Visual Inspection – TEF 3015HS					
Main Lines Sections	Foot or Rail Vehicle ≤7km/h	10	12	Patroller	1.5km – 109.9km TRL1,2&3 1100, 2100
Conventional Speed Lines	Foot	5	6	Patroller	To include Ebbsfleet High Level, Ashford Chords, Temple Mills Chord and Eurotunnel Interface
St Pancras – plain line and platforms	Foot or Rail Vehicle ≤7km/h	6	8	Patroller	Area from platform buffer to LT1 portal
Loops, Connections and Sidings	Foot	13	16	Patroller	To include Church Path Pit sidings, depot lines, ECML connection, Silo Curve, NLL Connection
Level 2 Visual Inspection – TEF 3022HS					
Level 2 Inspection	Foot or Rail Vehicle ≤7km/h	25	30		

Level 3 Visual Inspection – TEF 3017HS

Level 3 Inspection	Foot or Rail Vehicle ≤7km/h	100	110
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Table 2 – Minimum Frequency of Switch and Crossing Visual Track Inspection

Activity	≤200 km/h Concrete ^[1]	>200 km/h	Depots, Loops and Sidings	Documentation
Level 1 (Visual)	2 weeks	5 weeks	15 weeks	TEF 3015HS
	17 days	6 weeks	18 weeks	
Level 2 (Section Manager)	10 weeks	25 weeks	25 weeks	TEF 3022HS
	12 weeks	30 weeks	30 weeks	TEF 3074HS
Level 3 (Engineer)	50 weeks			TEF 3017HS
	55 weeks			

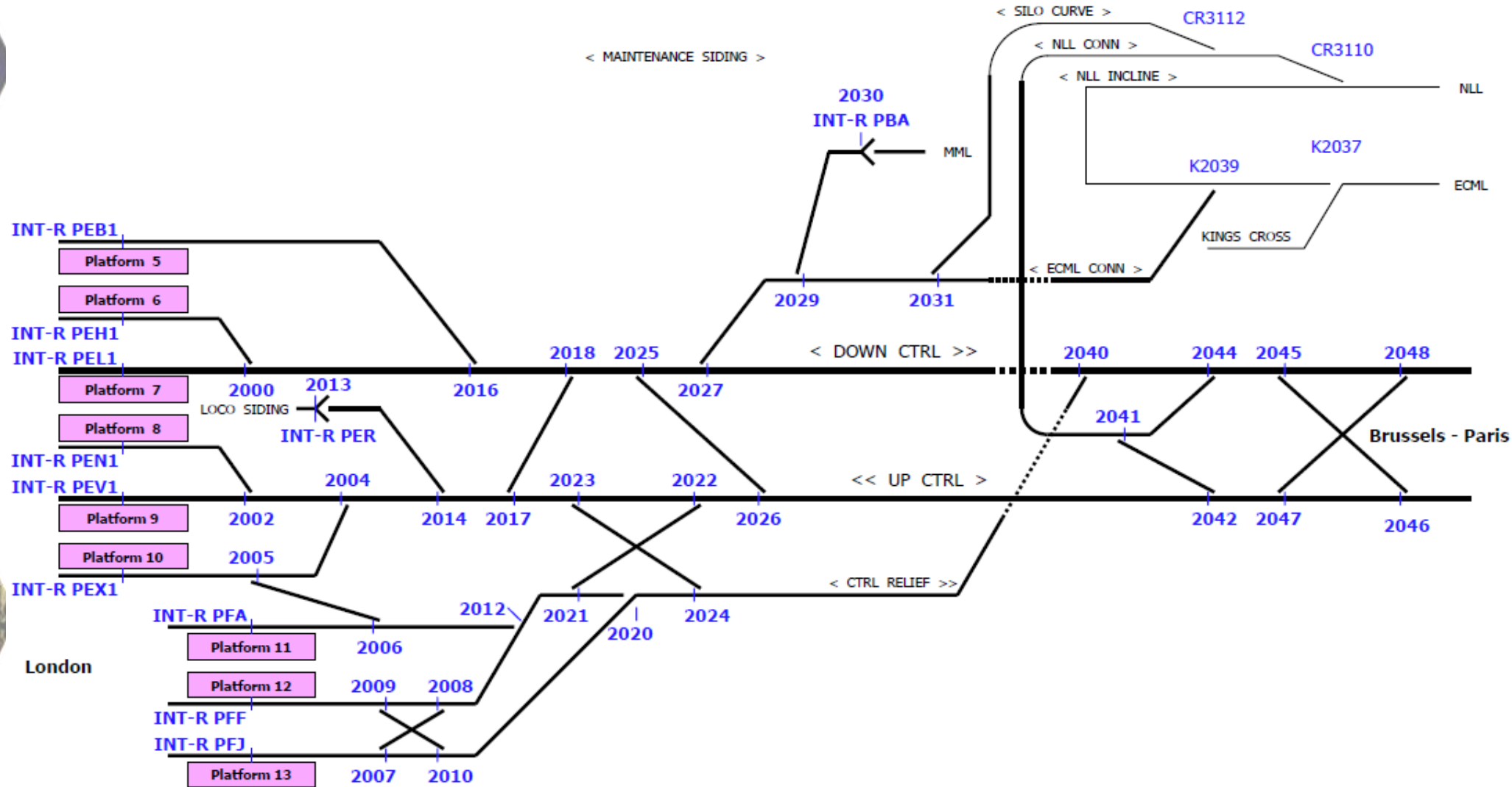
St Pancras International



St Pancras International



St Pancras Layout



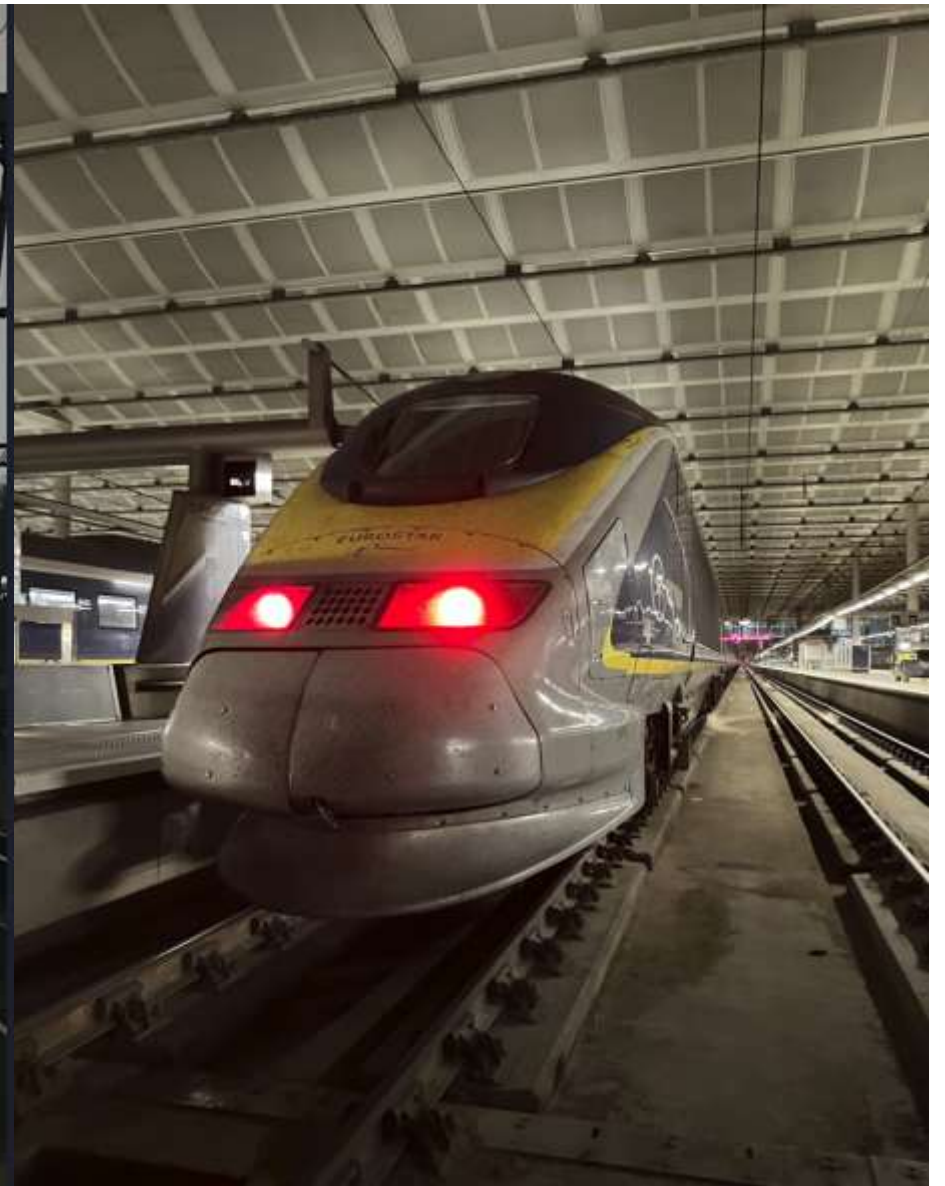
St Pancras Junctionwork



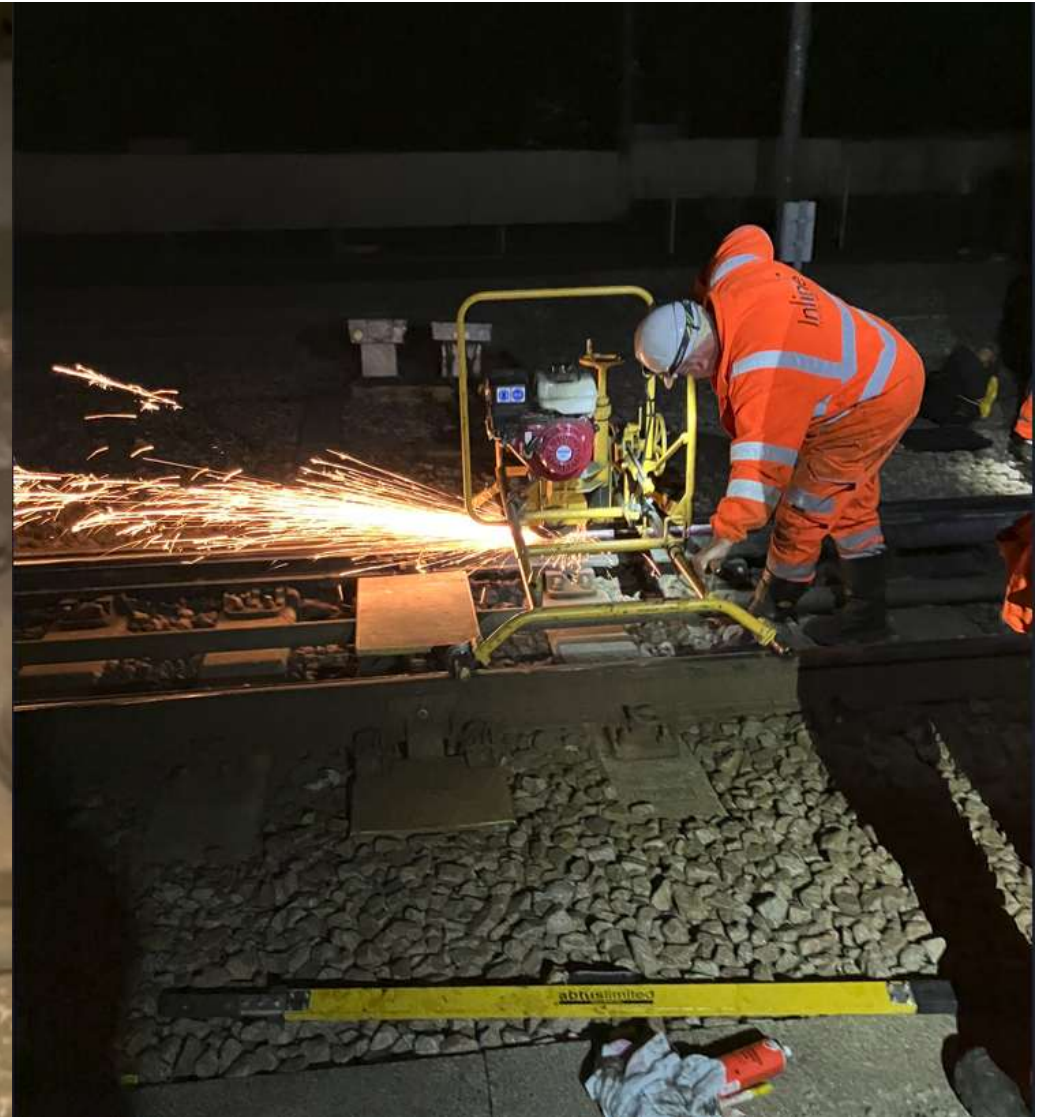
St Pancras Issues



St Pancras Issues



St Pancras Issues



London Tunnels 1 & 2





Javelin ride – hunting solution found

Living up to unrealistic expectations makes life difficult

A source of endless fascination has been the propensity for railway engineers and managers to fall in and out of love with new suppliers of traction and rolling stock. This goes back to the 1960s and explains why Thomas Didymus is this column's patron saint.

Of course, having found the new enlightenment, these previously rational people become proselytisers, seeking to get others to see the light. Tellingly, the DfT Rail line on this column's criticism of the Inter-city Express Programme was that 'Roger hasn't seen the light yet'.

And no one is immune. In an earlier manifestation I was a proselyte, in these very columns, for the 4,400hp Super Deltic to

maintain commercial journey times on the East Coast main line.

Mind you, I was very young. And, when the requirement was met, it still took two diesel engines to provide the 4,500hp needed, but installed in separate power cars.

Greener

Today there are still people who believe that main line diesel hydraulics were the way forward, despite the early withdrawal of the 'Westerns' and 'Warships'. Gas turbine traction makes periodic come-backs among the starry eyed.

Three-phase traction not only attracted acolytes, but had the always entertaining sight of

the French resolutely marching to a different drum down a blind alley, while maintaining that synchronous motors were the only rational choice.

German Railways' concept of the pioneering three-phase drive E120 multi-role locomotive, equally at home on high speed and heavy haul was, hawked enthusiastically round conferences as the new *wunderlok*. The fact that it needed over a thousand solid state devices in its inverters, which made it uneconomic, was somehow overlooked.

Most recently, the view that the grass is always greener and perfectly mown on the other side of the fence, dominated Railtrack's signalling strategy. After millions spent on cost-overruns

modern
railways

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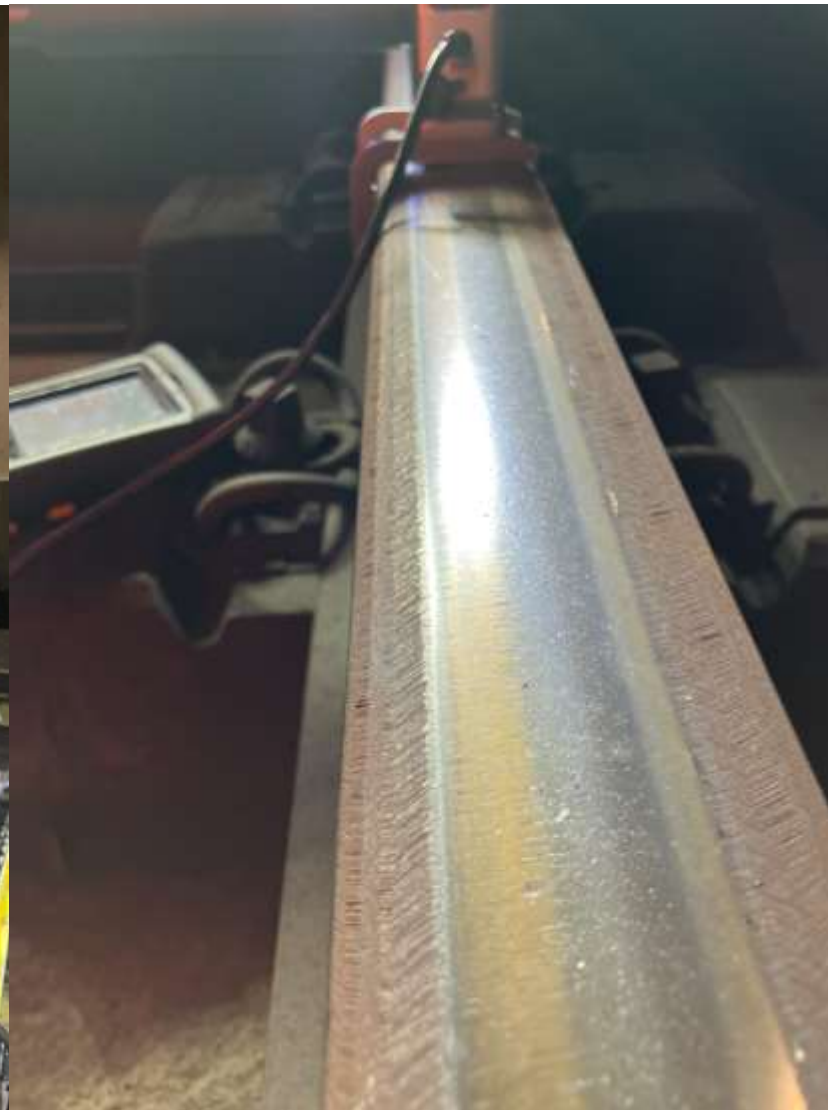
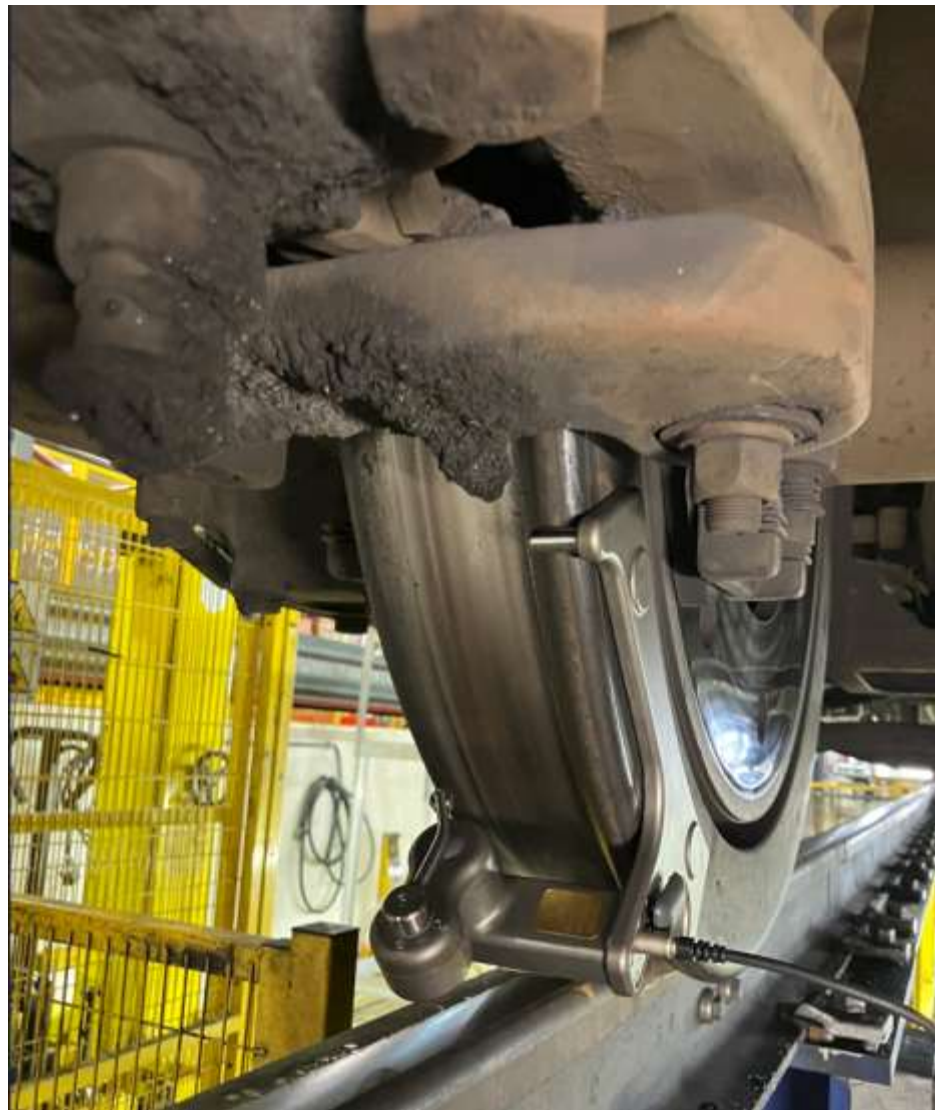
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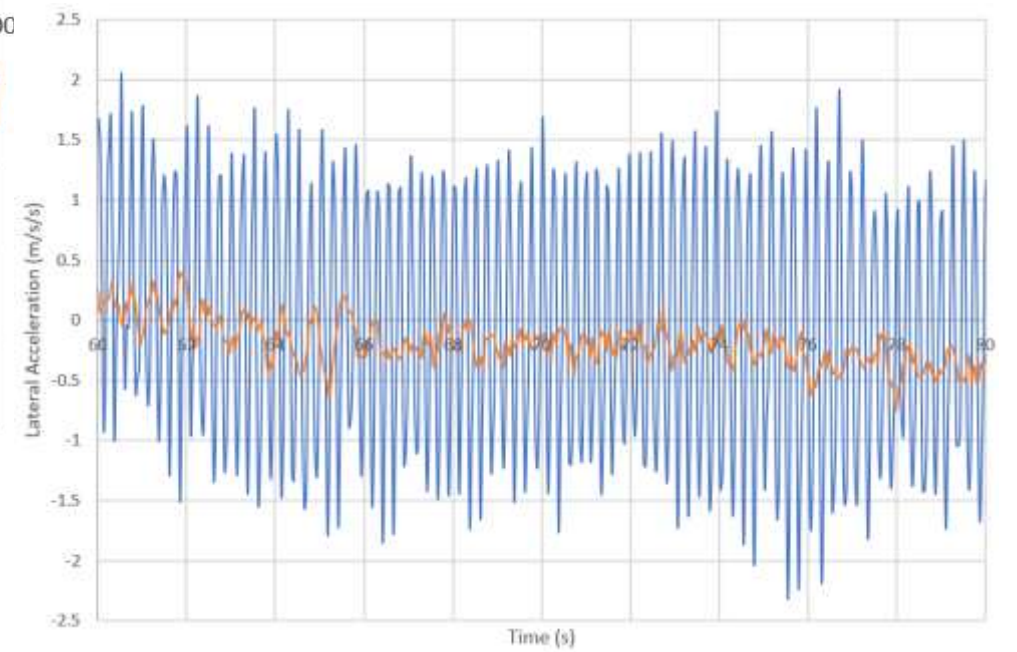
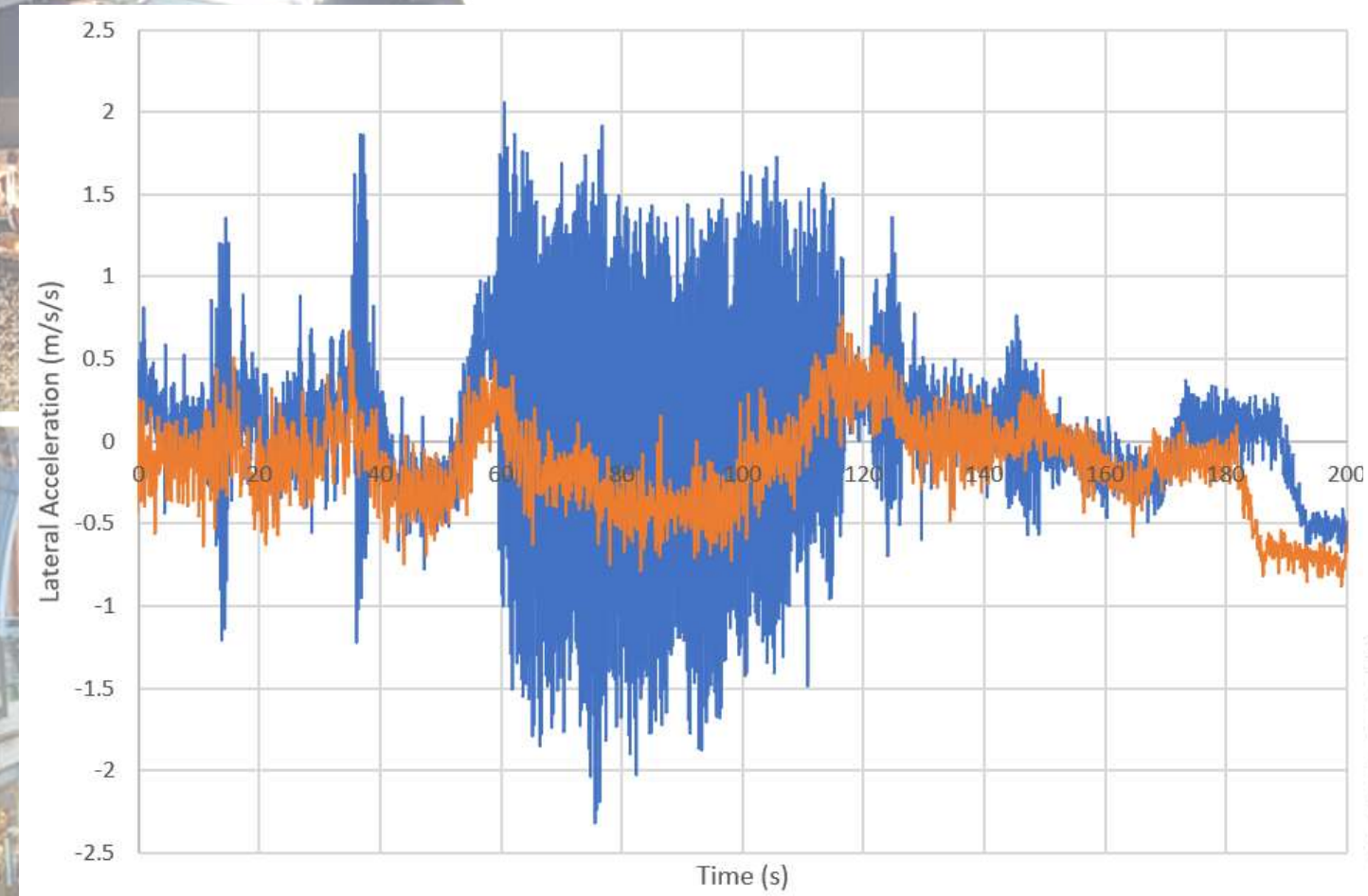


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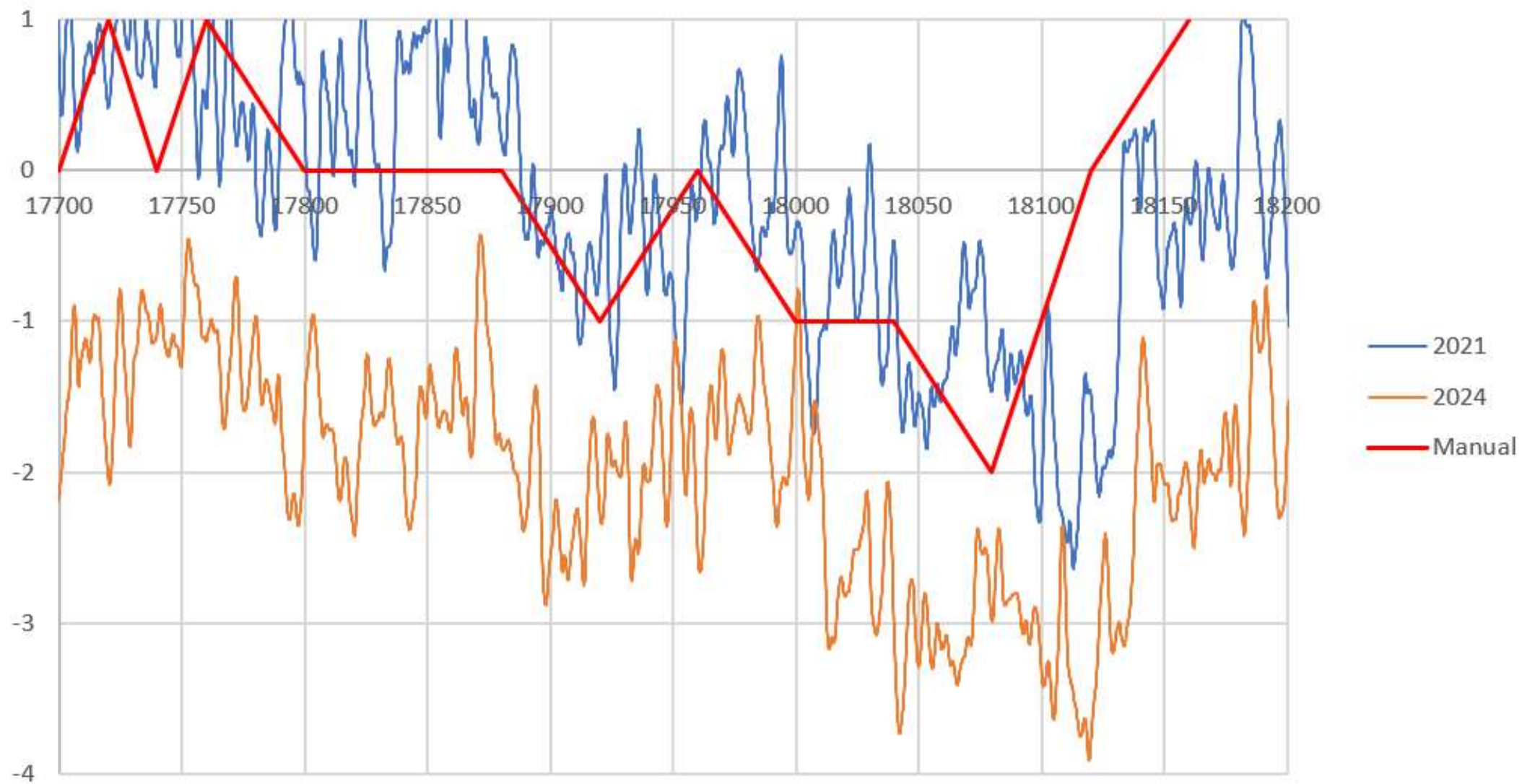
Equivalent Conicity



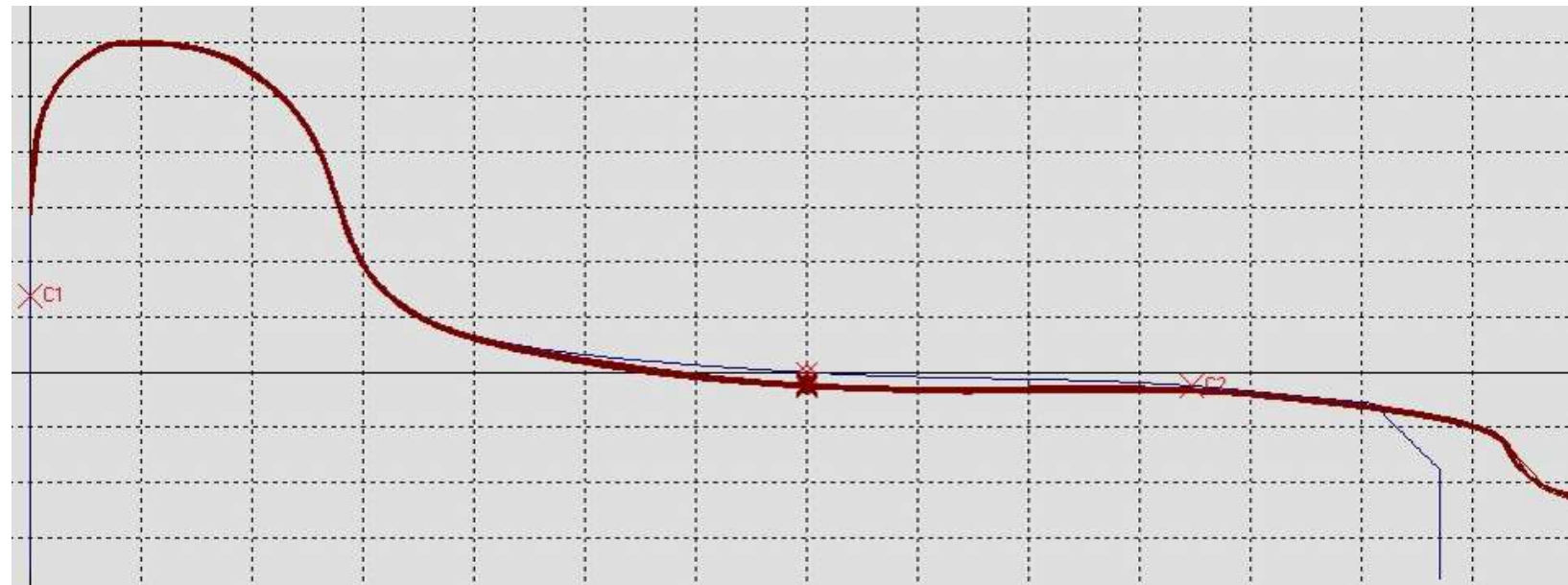
Class 395 Hunting LT2 Up



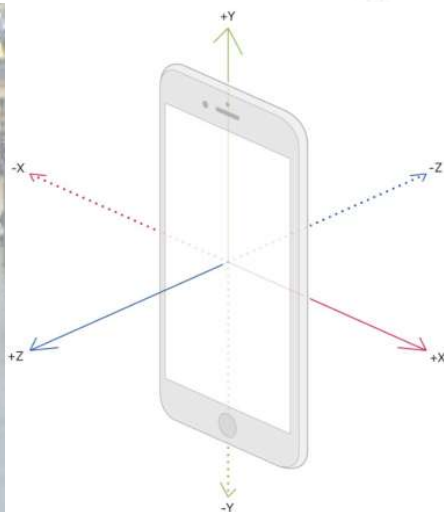
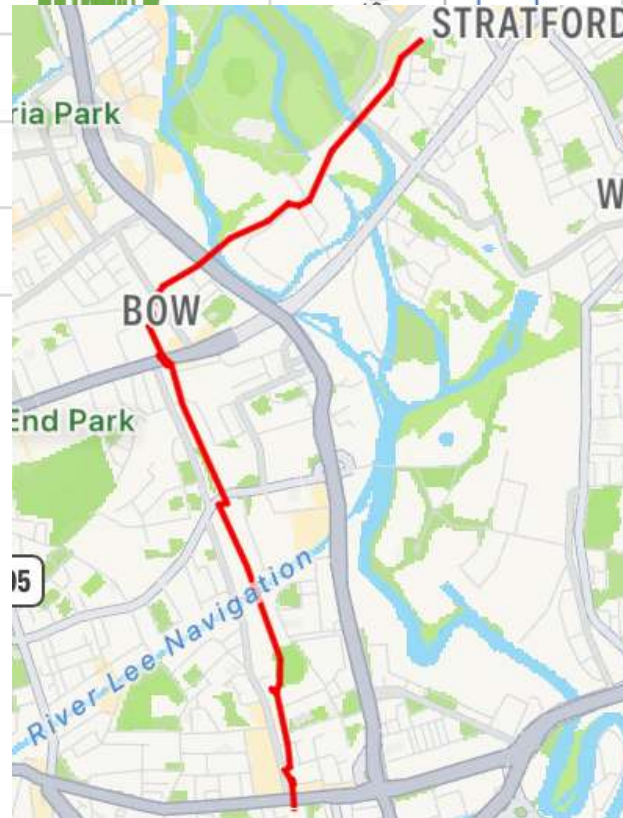
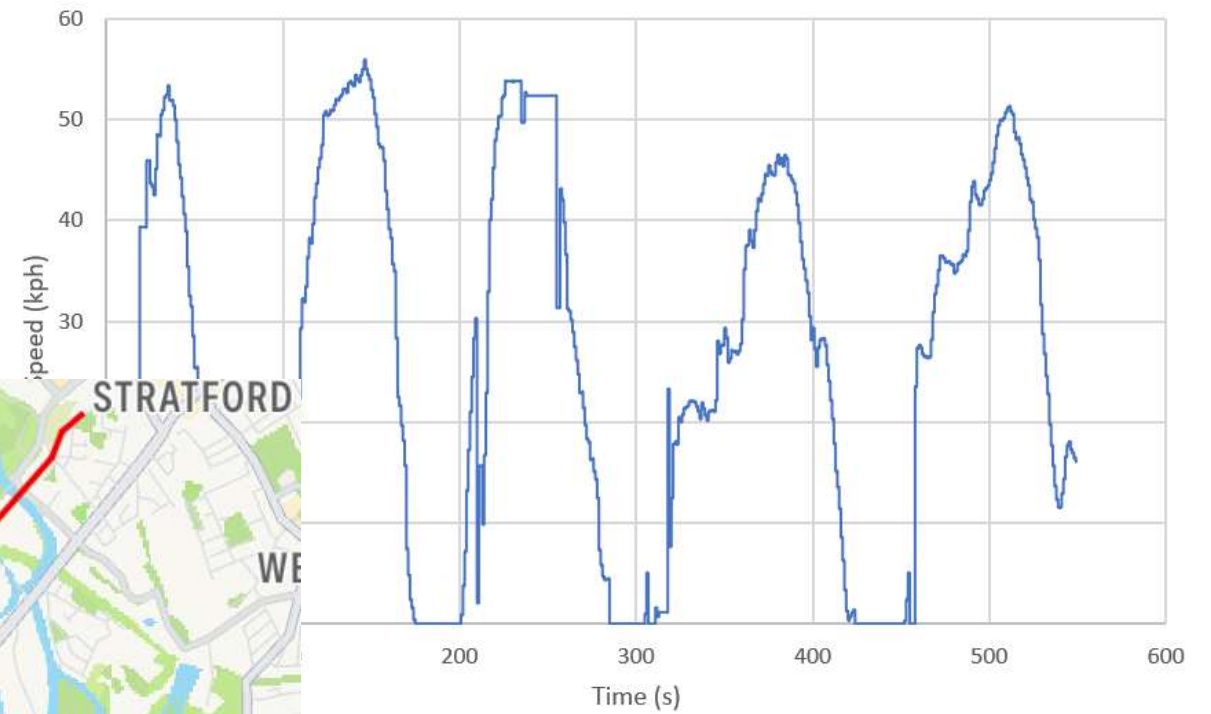
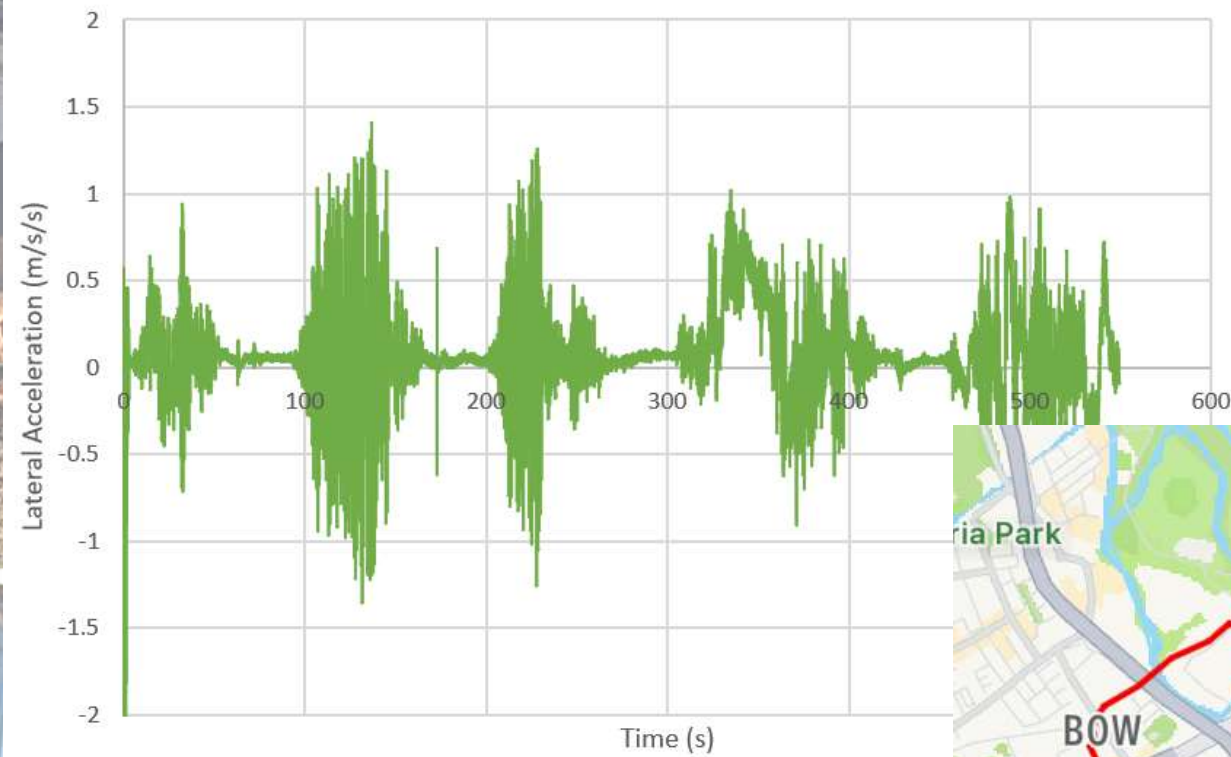
Class 395 Hunting



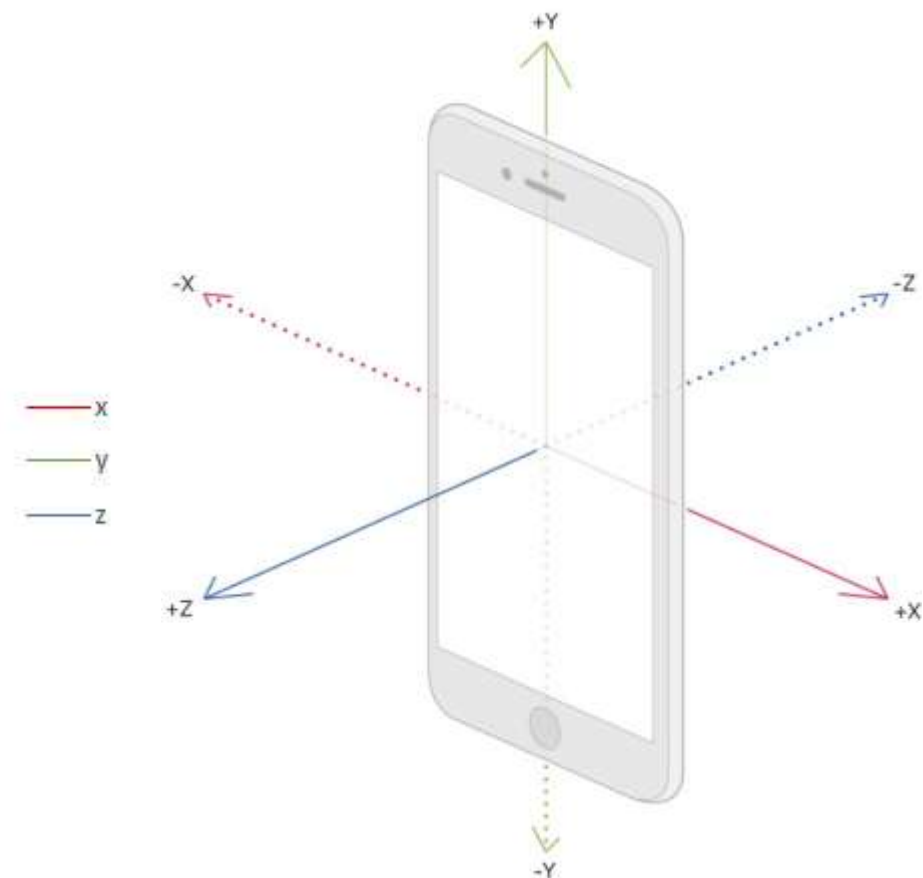
Class 395 Wheels



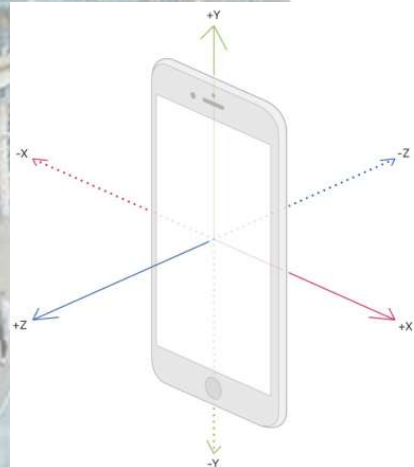
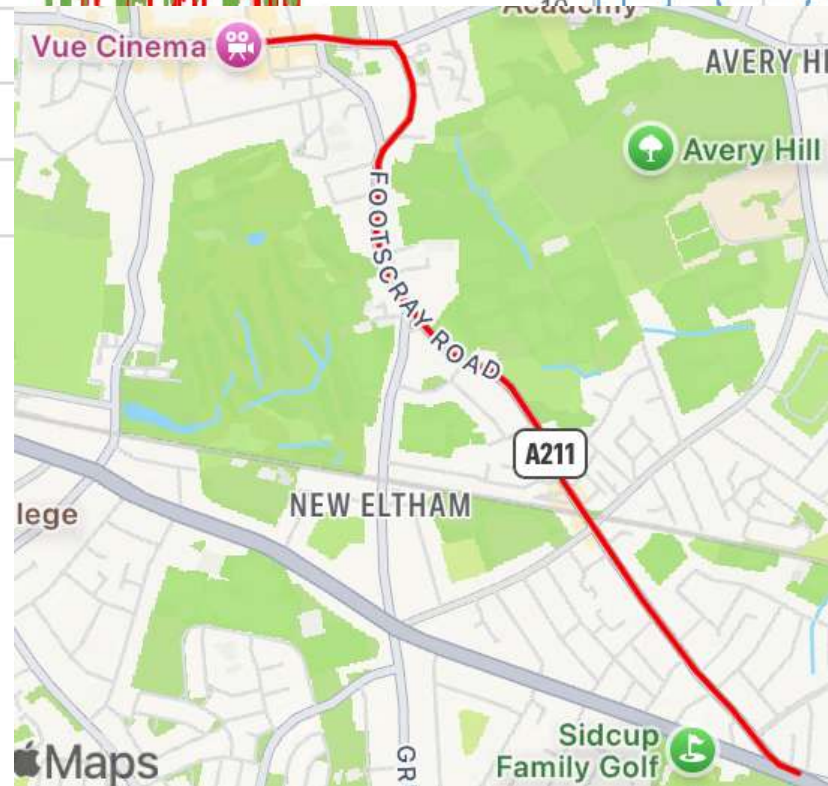
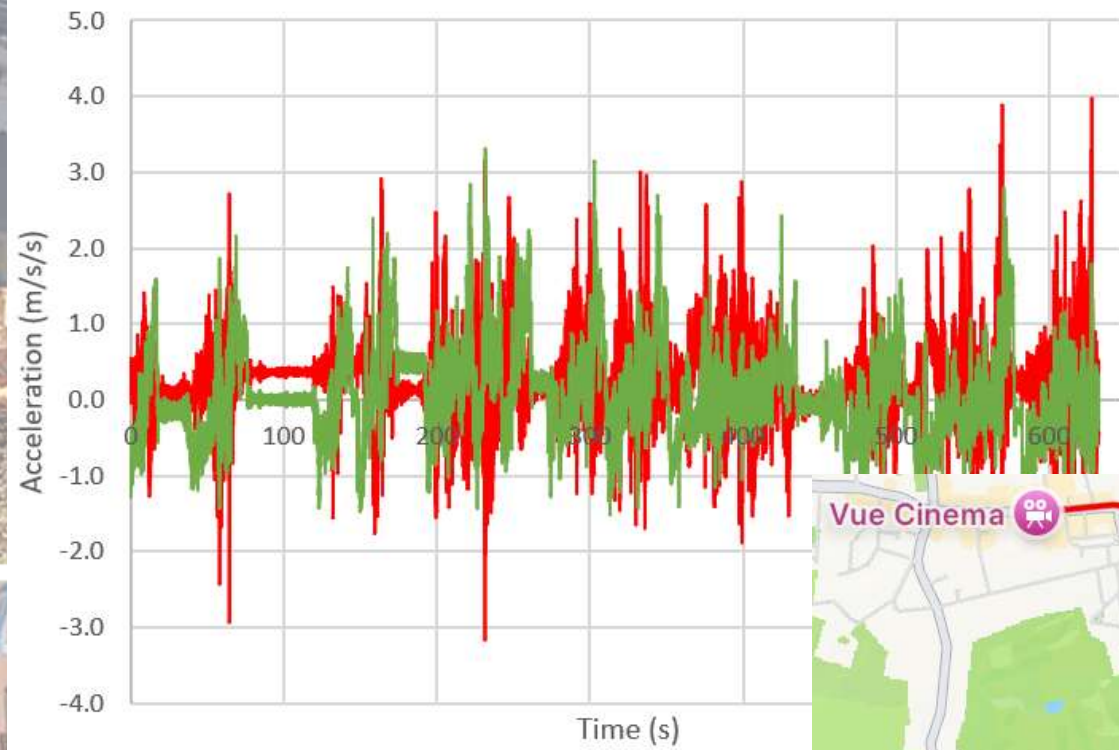
Ride Comfort



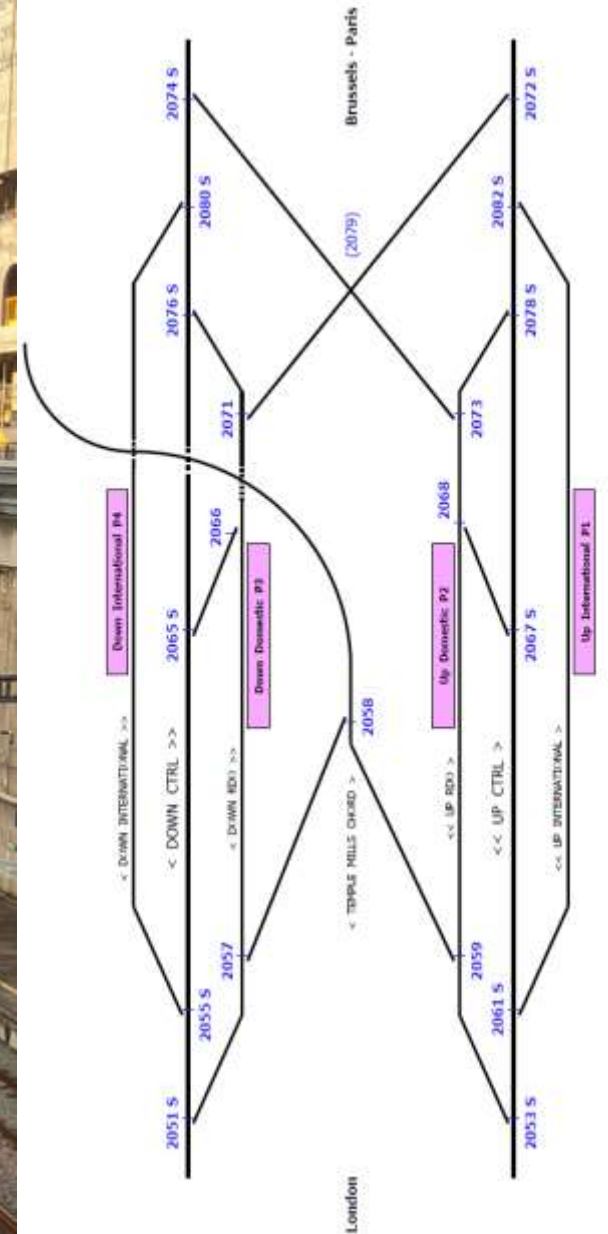
Ride Comfort



Ride Comfort



Stratford International



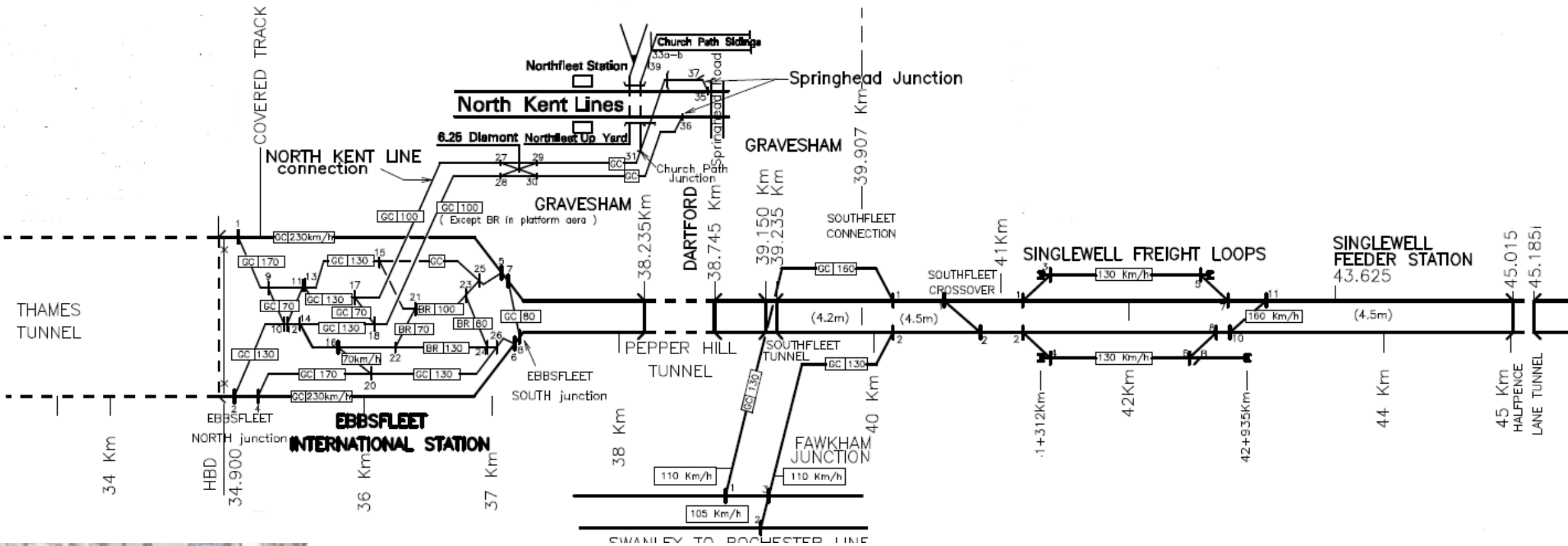
Ebbfleet International



Singlewell Infrastructure Maintenance Depot



Section 1 & 2 Junction



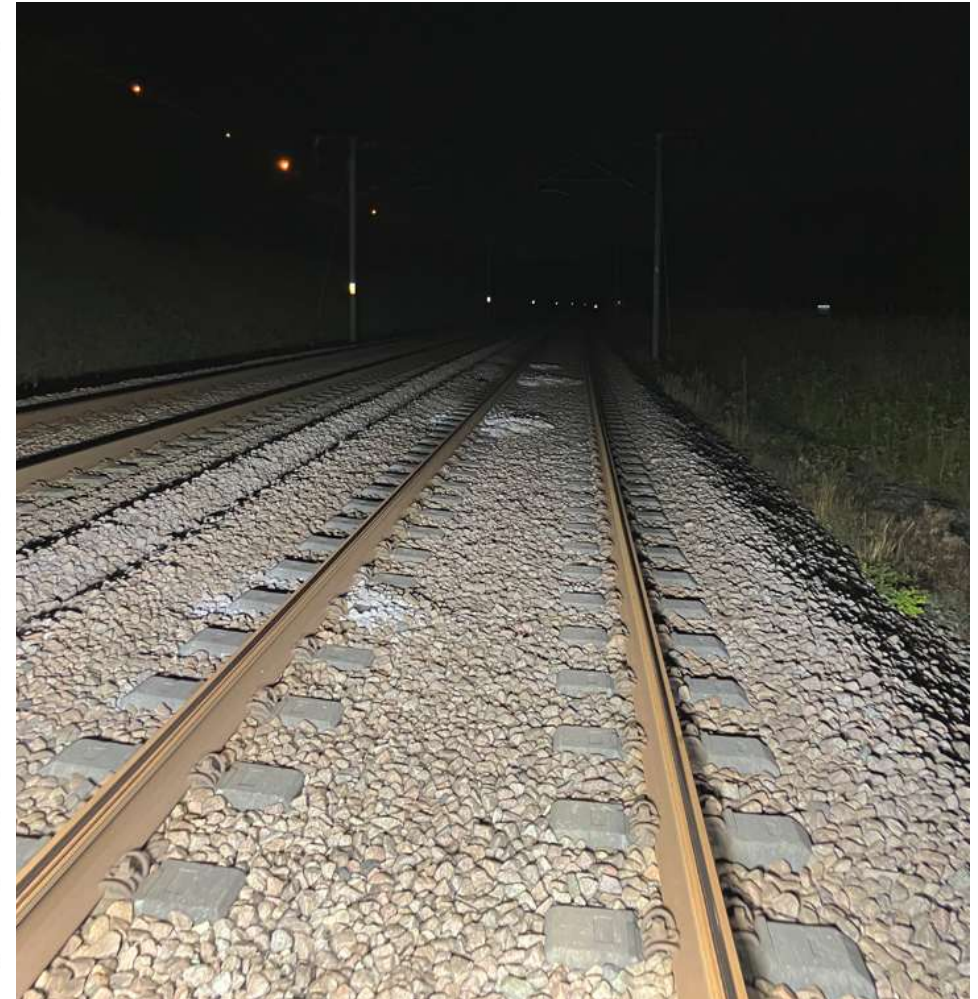
Freight Loops: Singlewell & Lenham



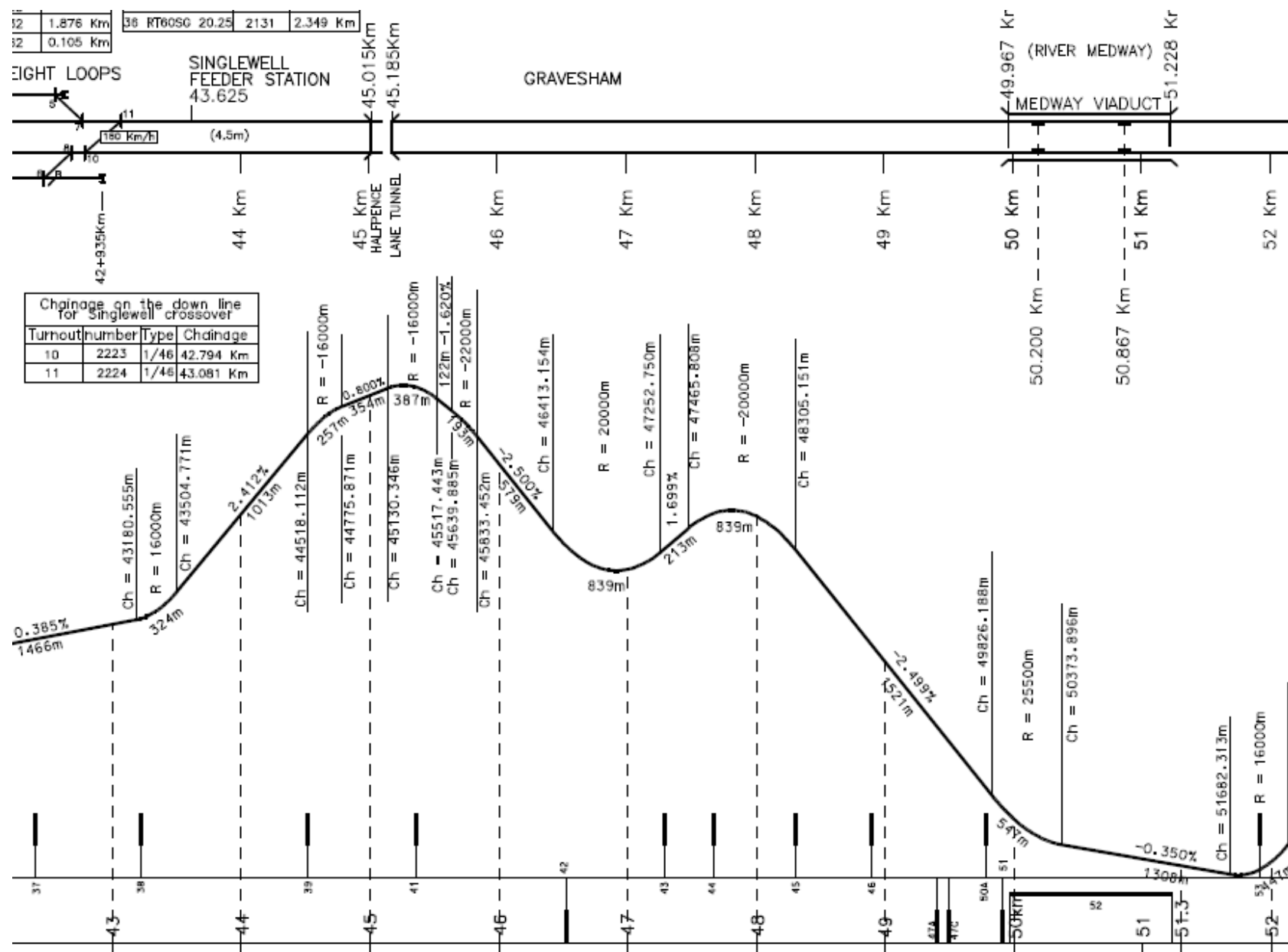
2.4.1 Horizontal and Vertical Curves

Parameter		Normal Limit	Exceptional Limit
Horizontal Curves	Horizontal Curve Radius	4000m @300 km/hr	arises from the calculation based on other parameters
	Curve Cant	160mm	160mm
	Cant Deficiency	110mm at 300 km/h	130mm at 300 km/h
	Excess Cant	90mm	110mm
	Cant Gradient	Between 0.35 mm/m and 0.60 @300 km/hr	between 0.3 and 0.72 @ 300 km/hr
	Rate of Change of Deficiency	30mm/s	50mm/s
Gradient		25mm/m (1 in 40)	25mm/m (1 in 40)
Vertical Curves	Vertical Curve Radius	16000 m @ 300 km/hr	14000 m @ 300 km/hr
	Hog	0.45 m/s ²	0.50 m/s ²
	Sag	0.45 m/s ²	0.5 m/s ² ⁽¹⁾
	Permissible change in gradient	1 mm/m.	1 mm/m.

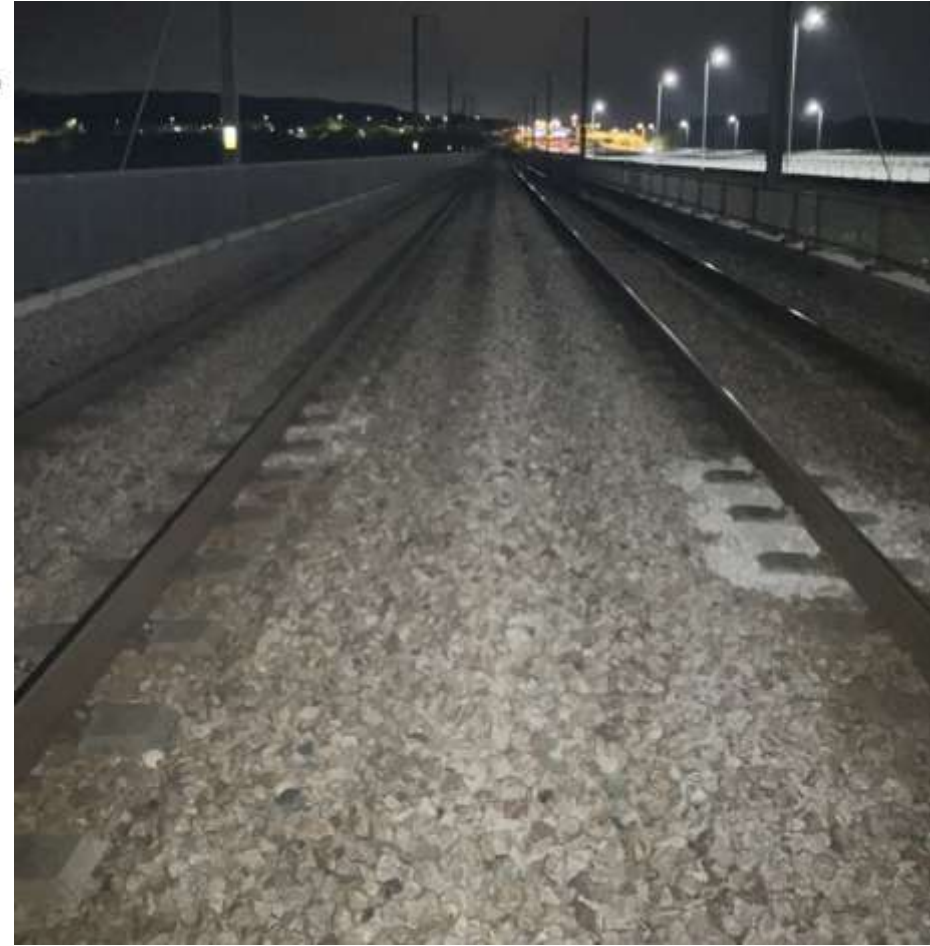
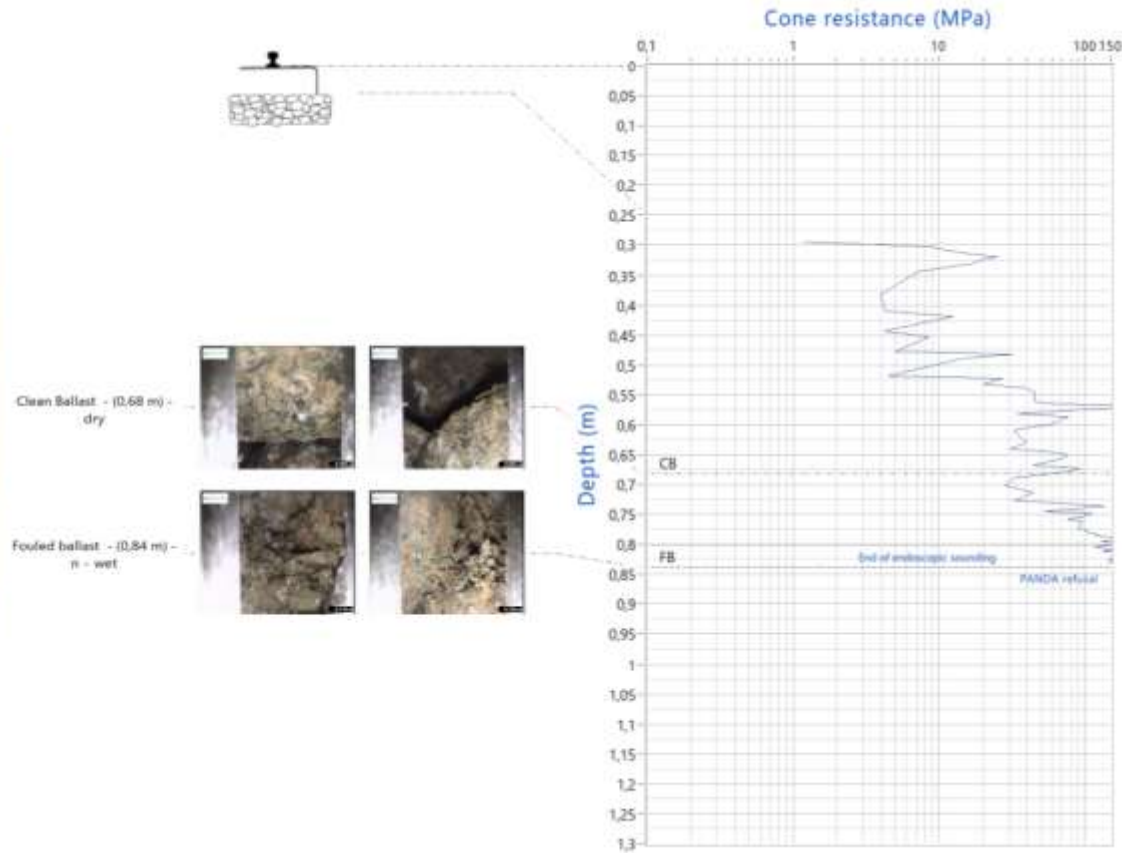
Table 2 – High Speed Lines Layout Parameters



300kph Track: Vertical

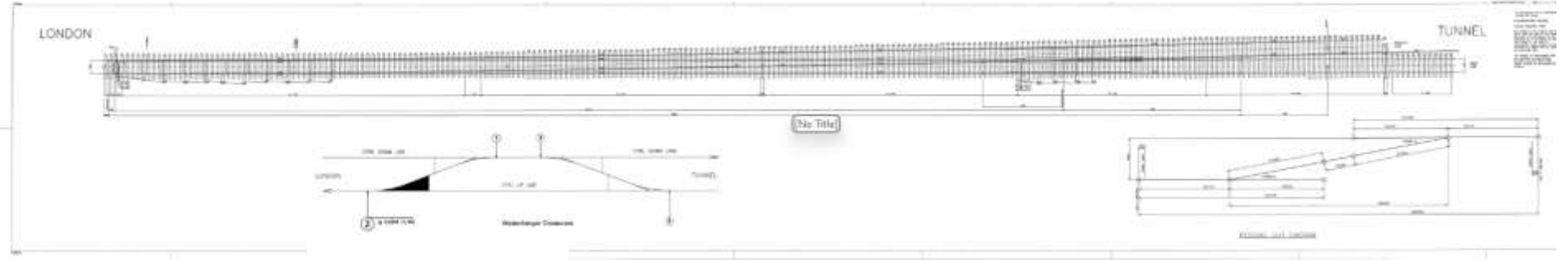


Ballast Conditions



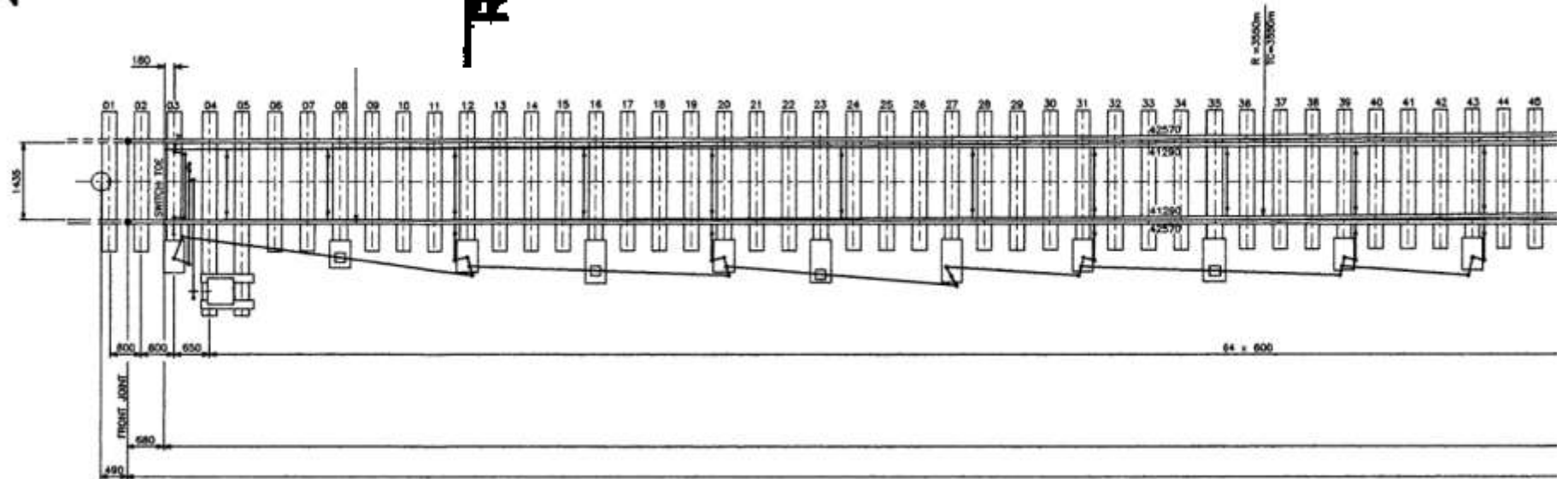
[PANDA® lightweight dynamic penetrometer - Sol Solution \(sol-solution.com\)](http://sol-solution.com)

300kph Junctionwork: 1/46



$R=3550m$

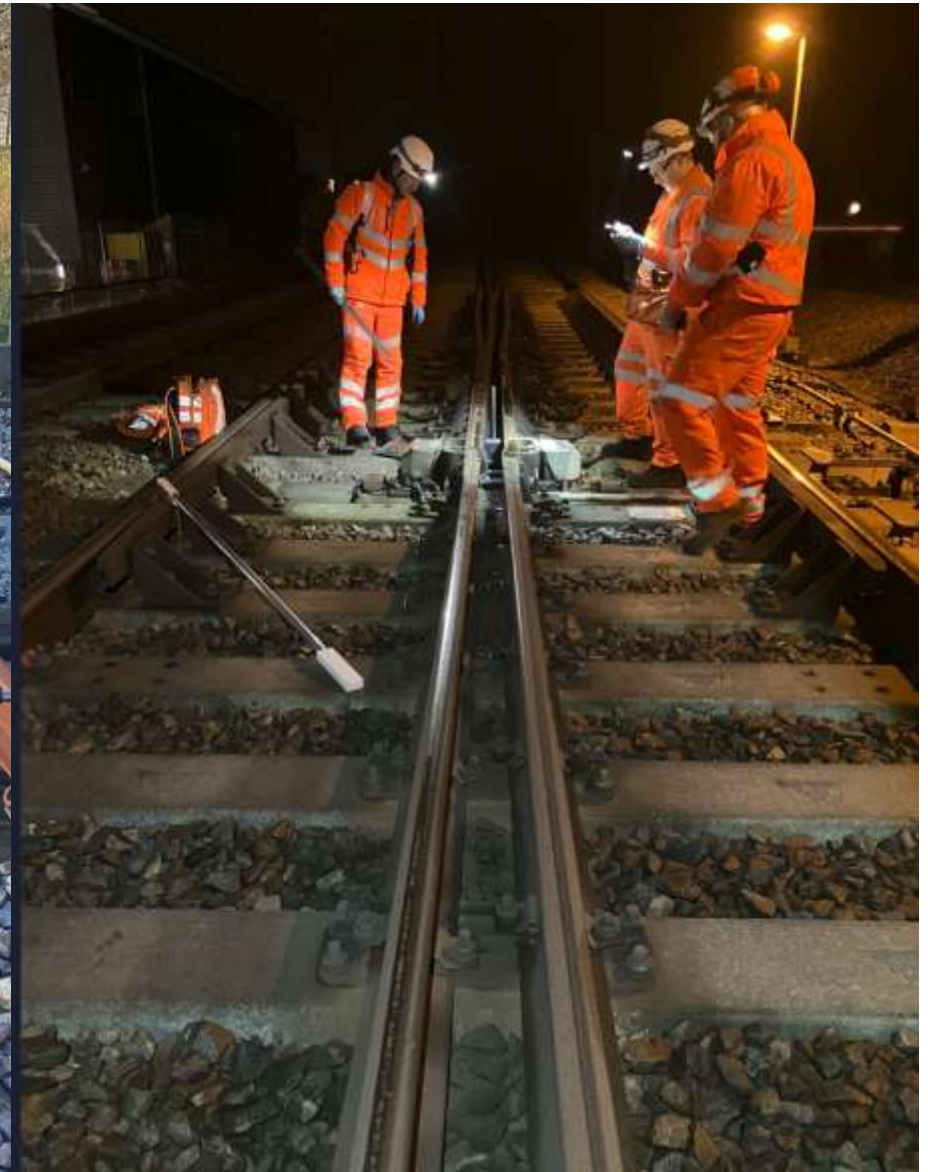
126588



300kph Junctionwork: Switches



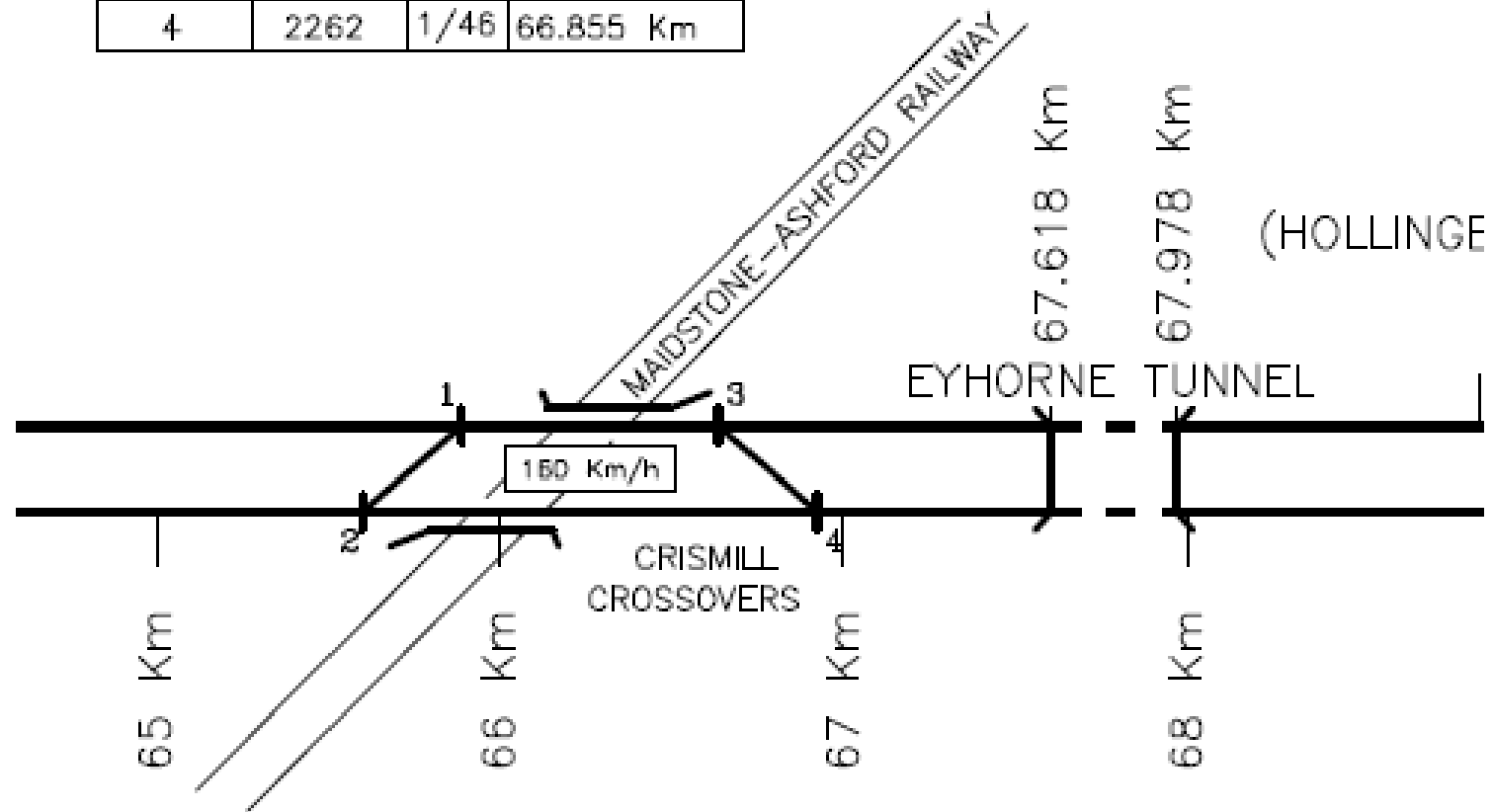
300kph Junctionwork: Swing Nose Crossings



300kph Junctionwork



Chainage on the down line for Crismill Crossover			
Turnout	Number	Type	Chainage
1	2252	1/46	65.887 Km
2	2251	1/46	65.600 Km
3	2261	1/46	66.569 Km
4	2262	1/46	66.855 Km



300kph Junctionwork



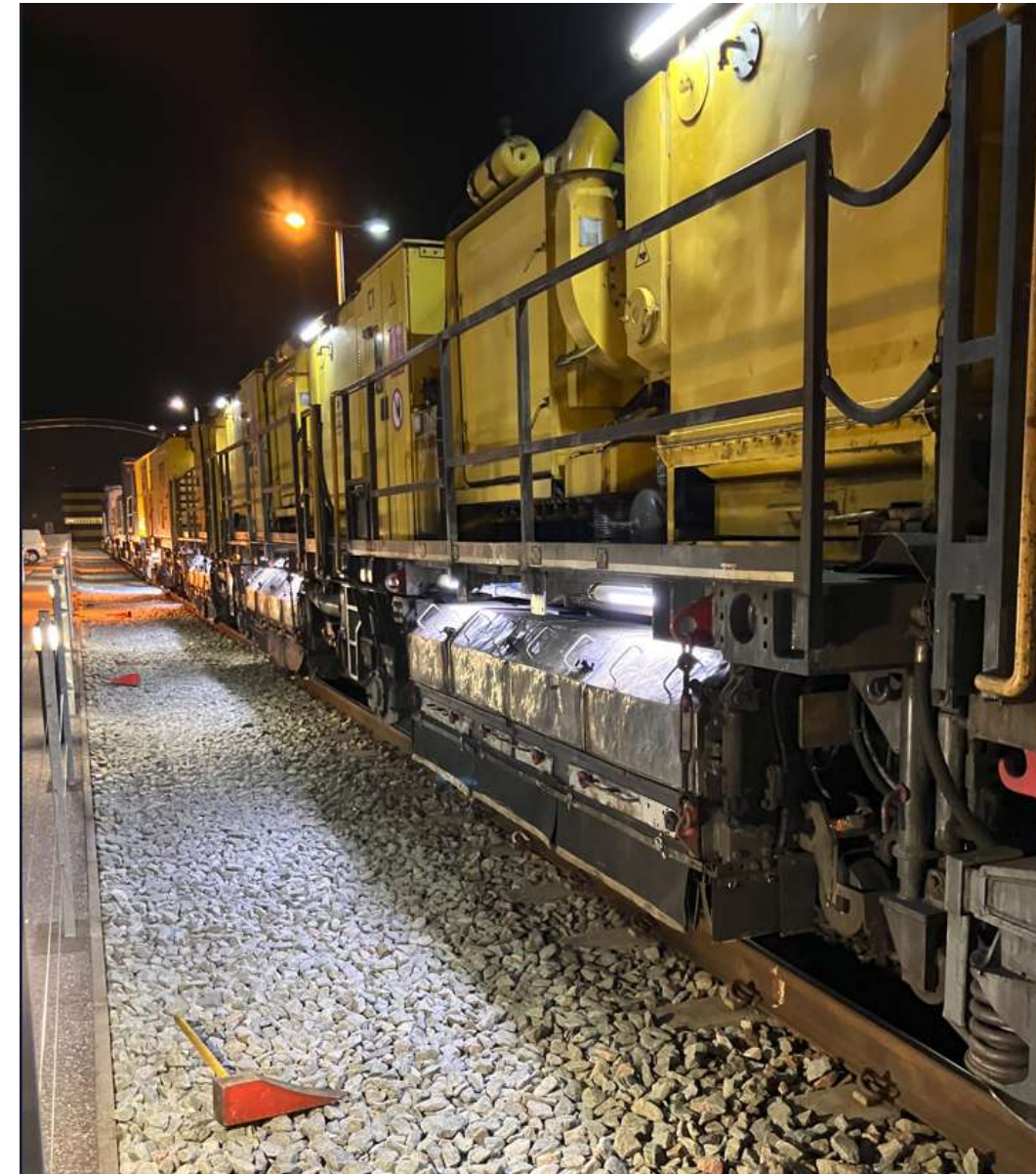
Ashford International



Plant



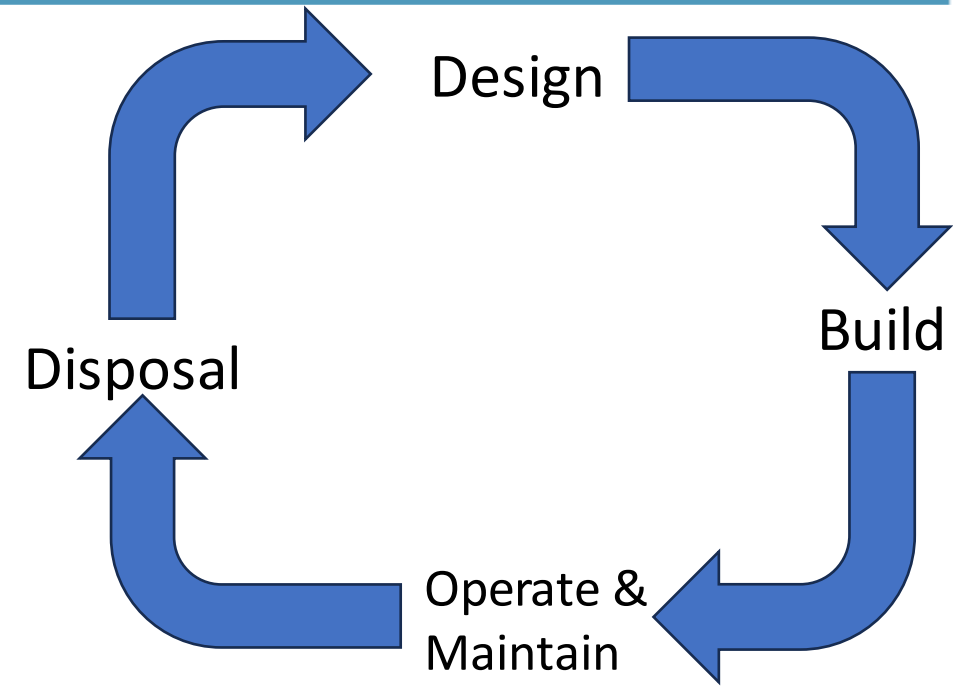
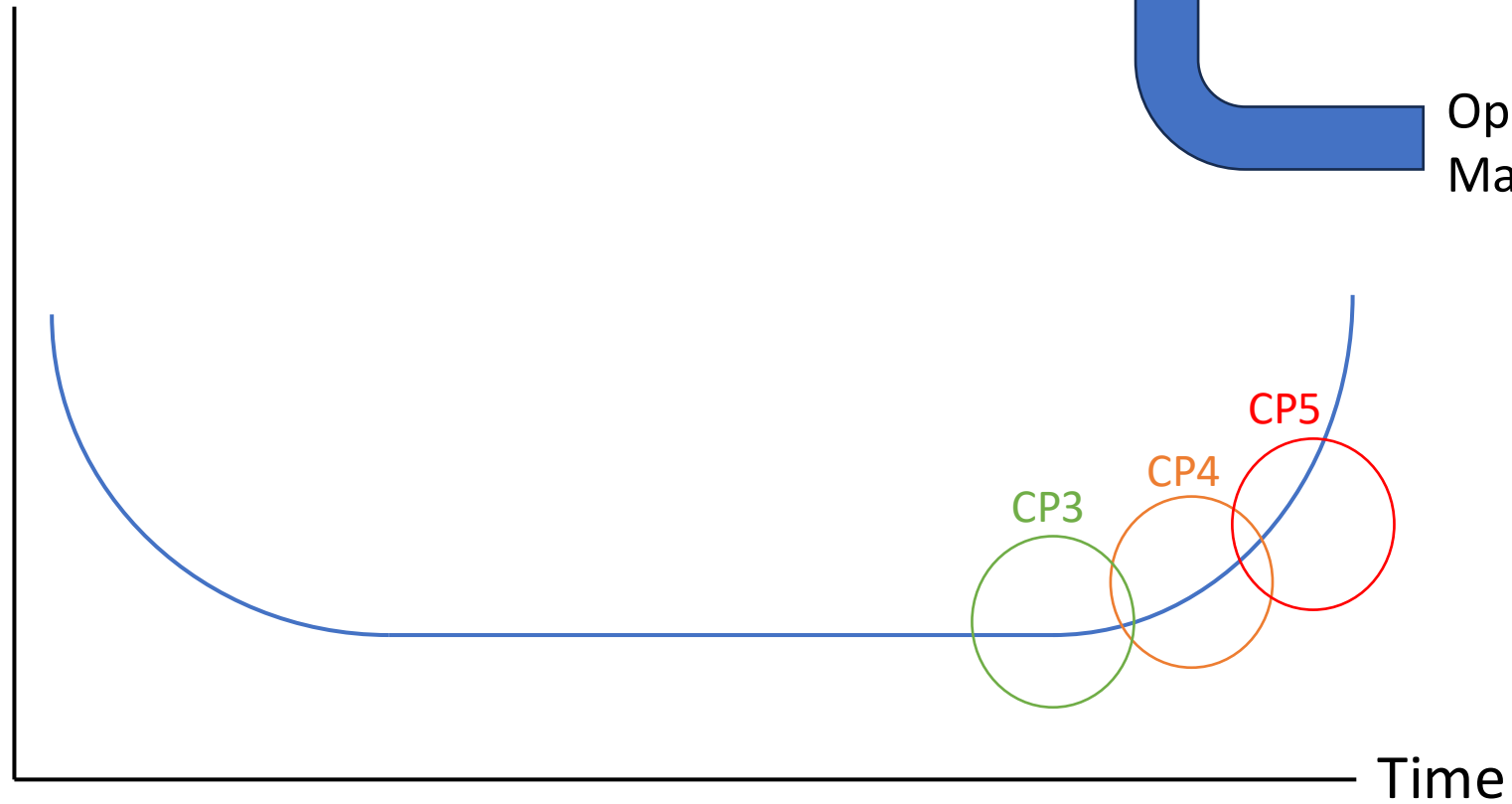
Rail Management



Renewals Strategy



Failure Rate



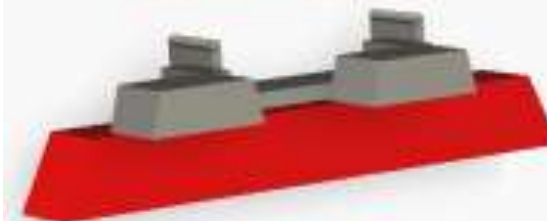
Renewal Strategy



Rail Renewals



Ballast Renewals



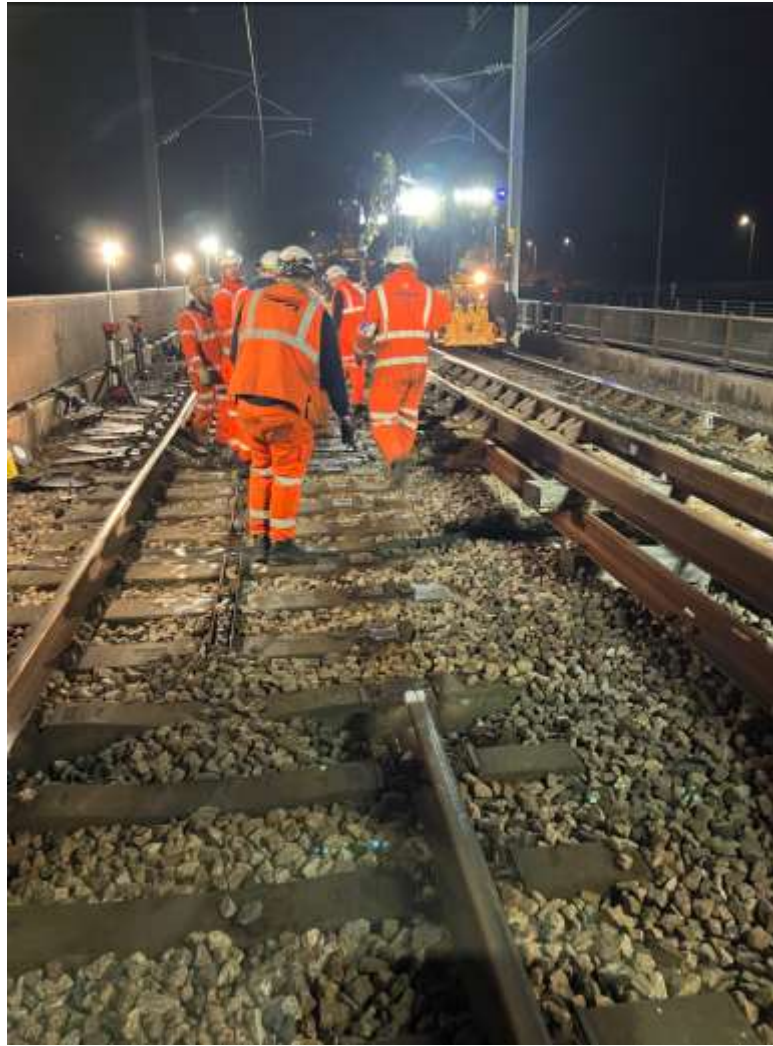
Sleeper Renewals



Medway Viaduct



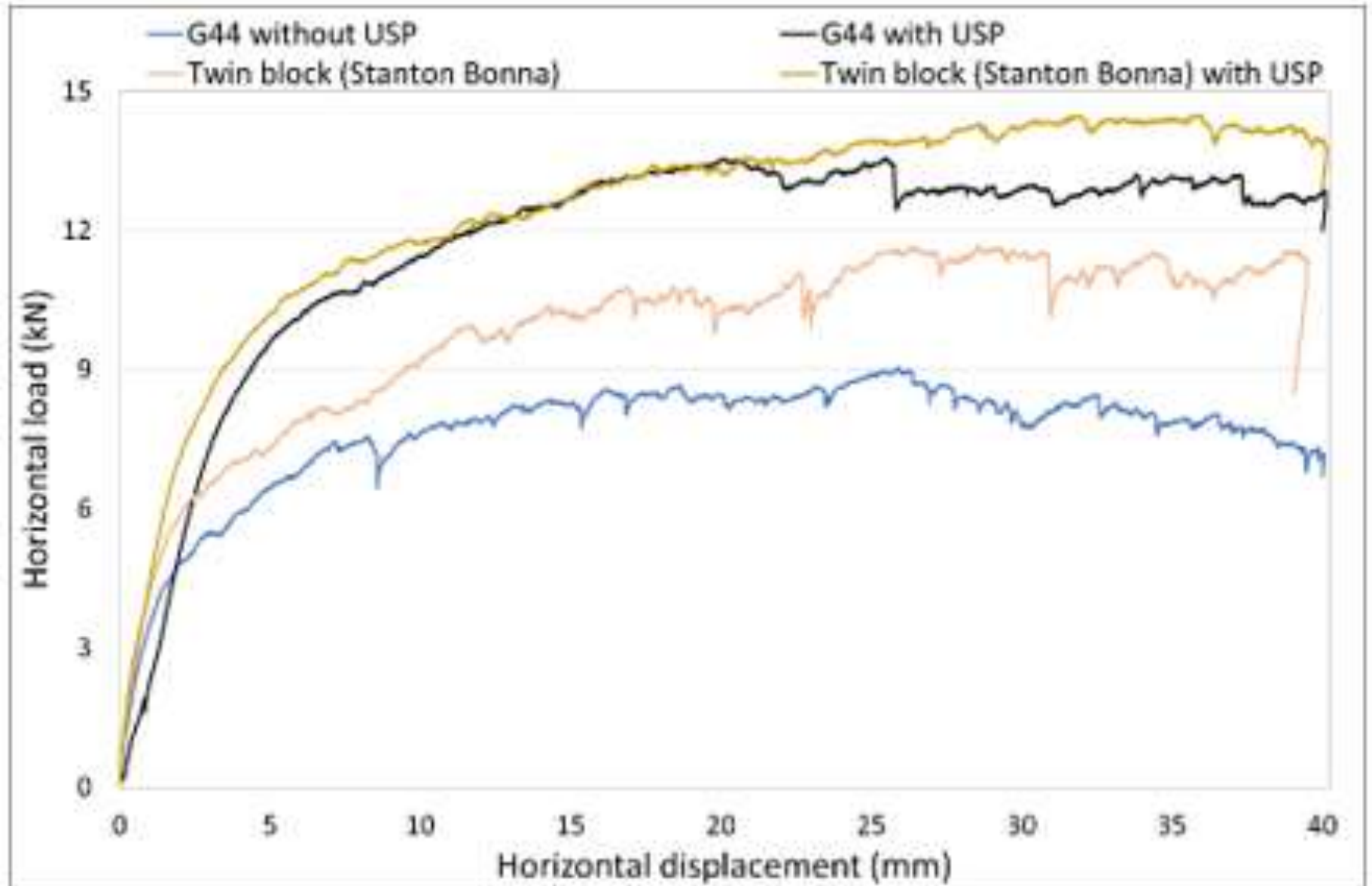
Medway Viaduct



R&D: Lateral Track Stability



R&D: Lateral Track Stability



R&D: On Board Monitoring





Lower fees to be charged to firms using HS1 line



The High Speed 1 line is used by Eurostar, Southeastern and freight trains

Daniel Sexton
BBC News, South East
[@DanSextonBBC](#)

Periodic review of HS1 Ltd 2024 (PR24)

Final Determination

06 January 2025

[Periodic review of HS1 Ltd 2024 \(PR24\): Final Determination](#)

The Future? Try Again....



The Future? Plain Line Inspections



The Future? S&C Inspections



The Future?



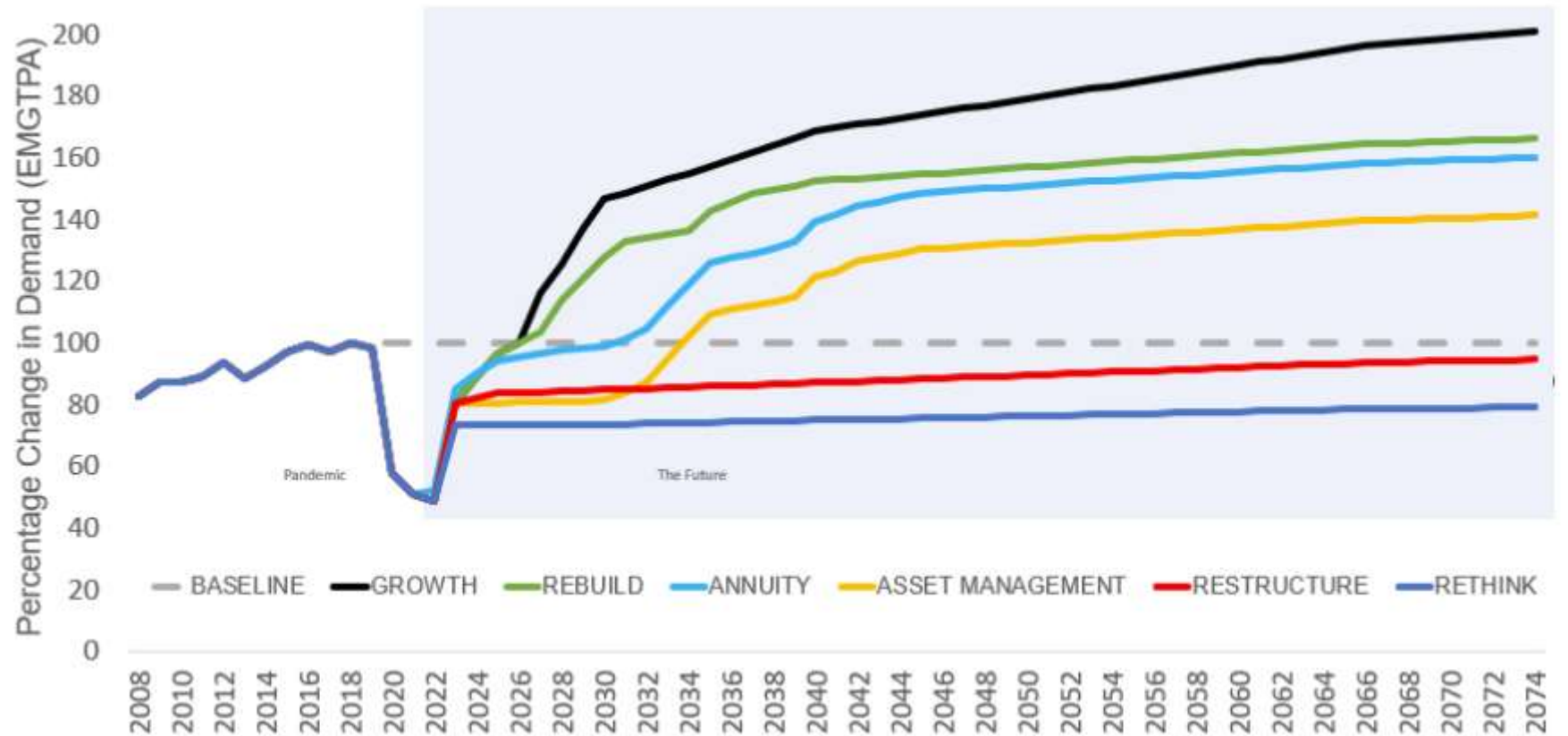
HSI Ltd commissions study to expand St Pancras International Station

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Virgin Group in race to purchase high-speed models ahead of rival

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Any Questions?