

Belfast Transport Hub - Permanent Way



Slide Schedule



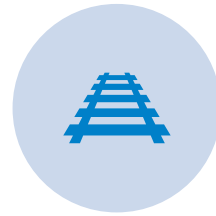
TIMELINES



SITE OVERVIEW



DELIVERY
STAGES



BLYTHEFIELD
CURVE PANEL
BUILD



PLANT &
LOGISTICS

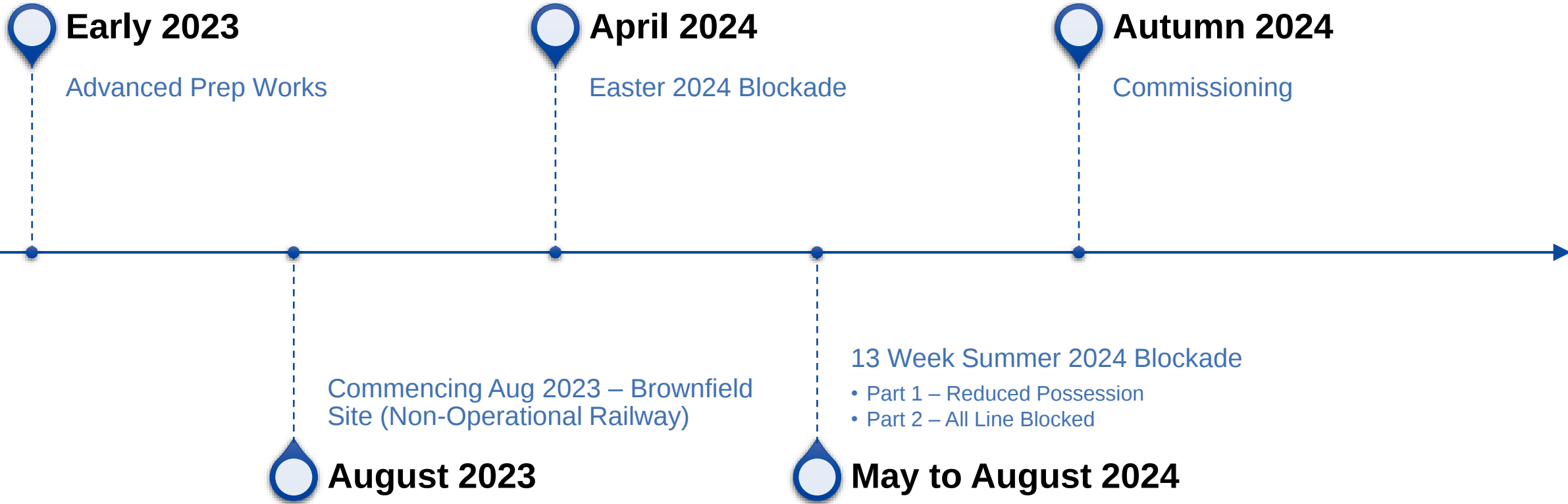


FORMATION
DESIGN

Advanced Timeline – Early Stages

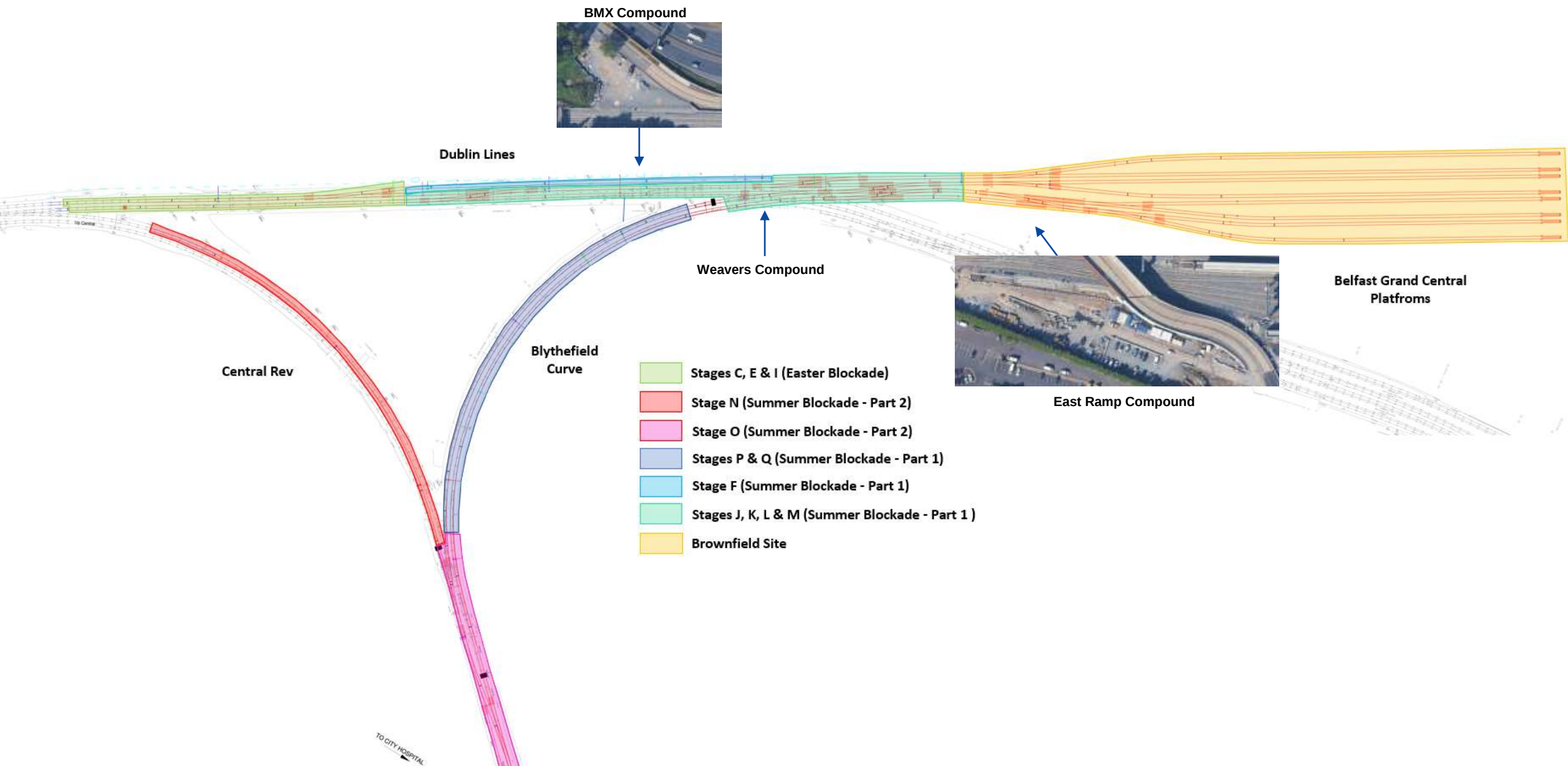


Permanent Way Delivery Timeline



Great Victoria Street Station





BTH Site Overview

Brownfield Site

- The formation build up within the Brownfield site was constructed by the main station contractor, FSJV, and then handed over to Babcock for the Track Systems install.



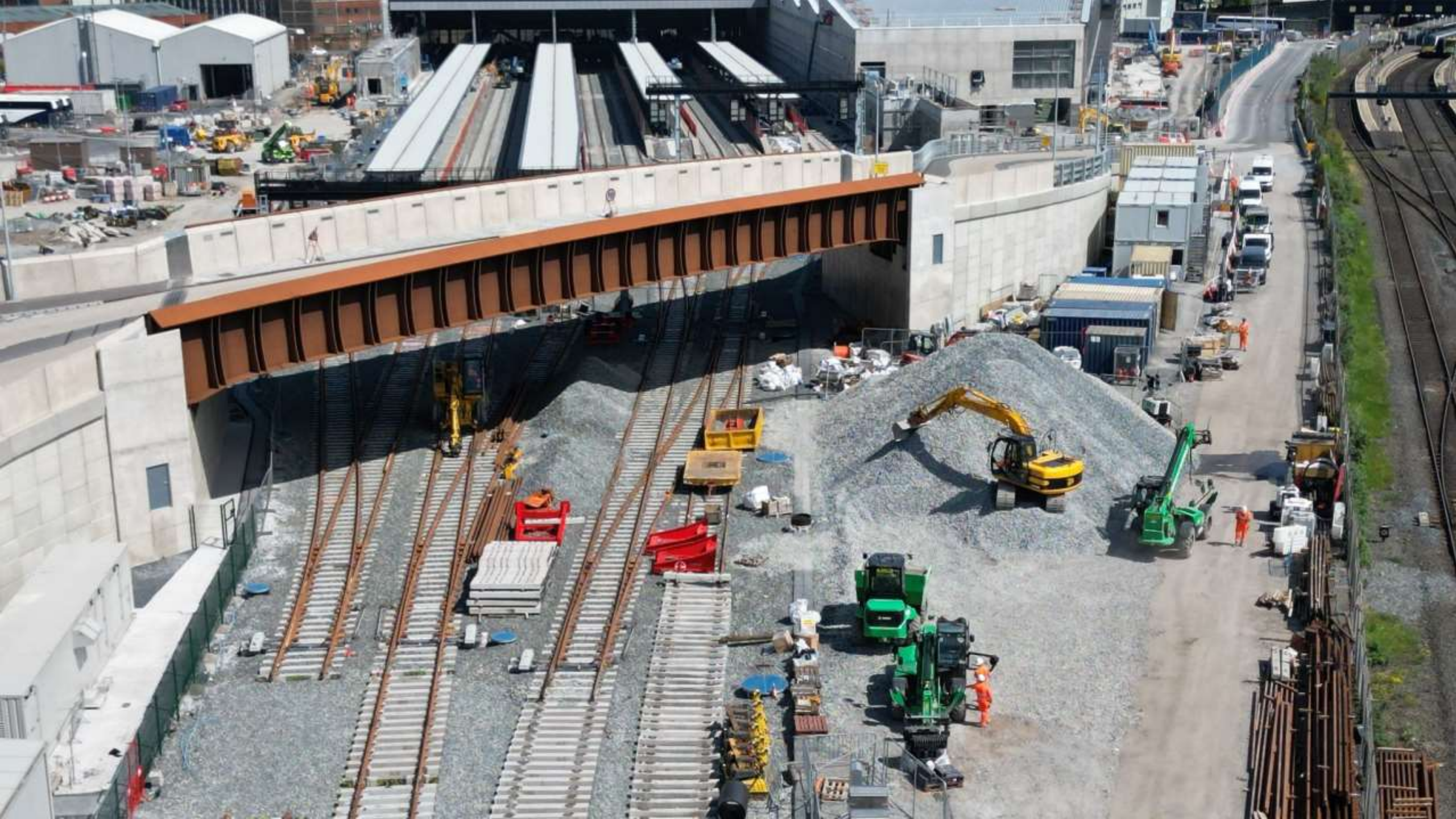


Non-Operational Works (Brownfield Site)

The platforms & 'Throat' area was completed between August – December 2023 whilst GVS was still fully operational

- **Dozing of Bottom Ballast**
 - 8no Platforms
 - 6no Point Ends

Removed substantial work from the main summer blockade, easing pressure & reducing disruption to the public



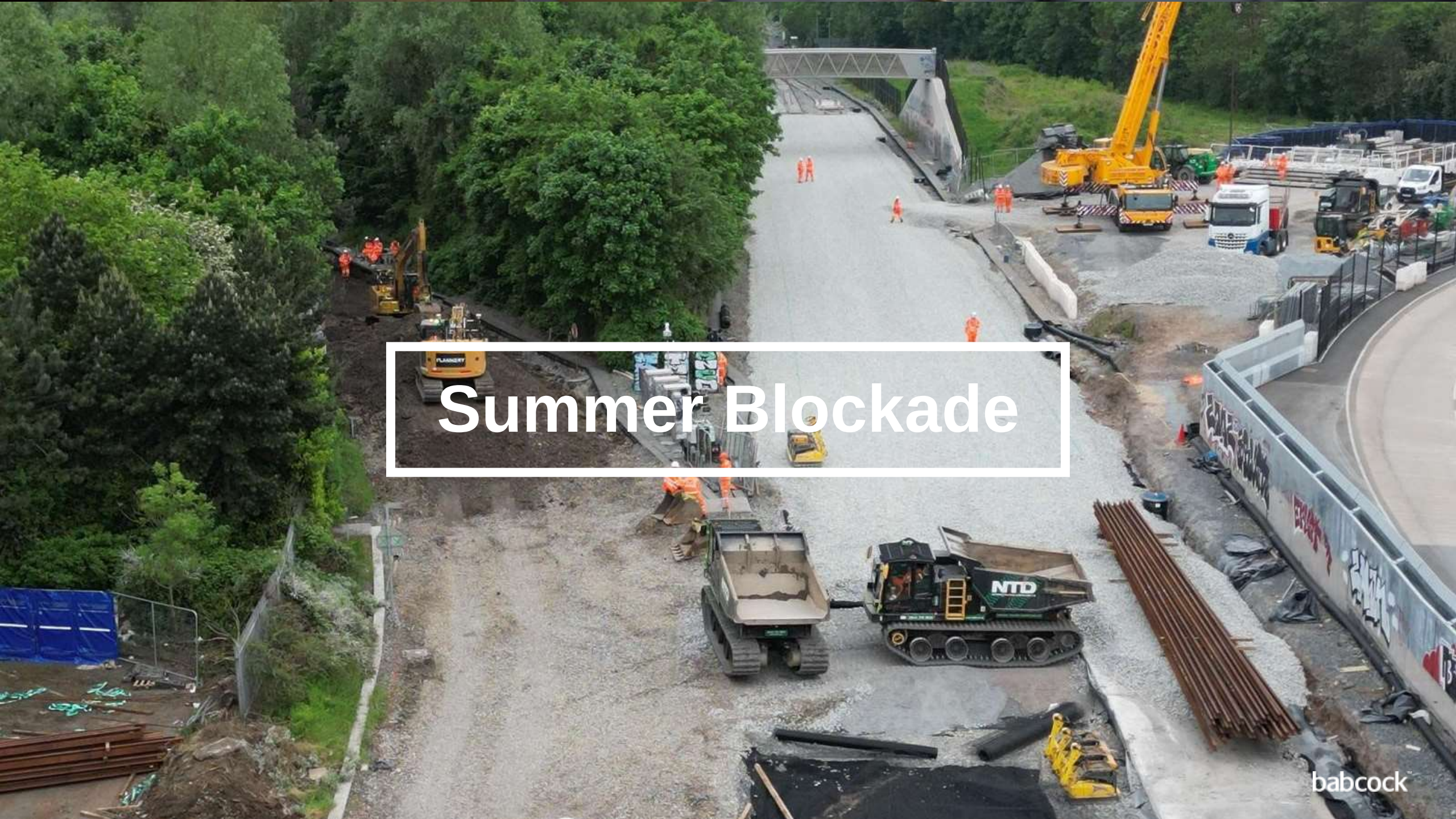


Easter Blockade Works Stage E, C & I

- The first of the disruptive works included:
 - Up Dublin: 170m track renewal inc. formation works
 - Down Dublin: 185m track renewal inc. formation works
 - Installation of 778Pts leading into the new Down Dub Rev line to service Platforms 7 & 8

This was an opportunity to carry out time motion surveys in preparation for the Summer blockade & assess the effectiveness of compounds





Summer Blockade



Summer Blockade – Part 1

Key Objective – Tie in the new Dublin & Blythefield lines to the track constructed prior in the Brownfield site

- Upon mobilizing, the existing railway boundary fence was removed and the track lifted out - including the Great Victoria Street lines
- The central lines remained opened for the duration of Part 1, allowing the Dublin Enterprise service to continue operating via Lanyon Place

Summer Blockade – Part 1

- A huge part of the summer blockade was the completion of the ‘foundation slab’ that forms part of the formation detail.
- The installation of the slab was a critical activity in the delivery of the summer blockade, as any delays to the schedule would have had pushed out the subsequent installation of the track above.

The slab installation also introduced a track access problem as it essentially cut off the Brownfield site from the Dublin/Blythefield lines. An access road was created to solve this.



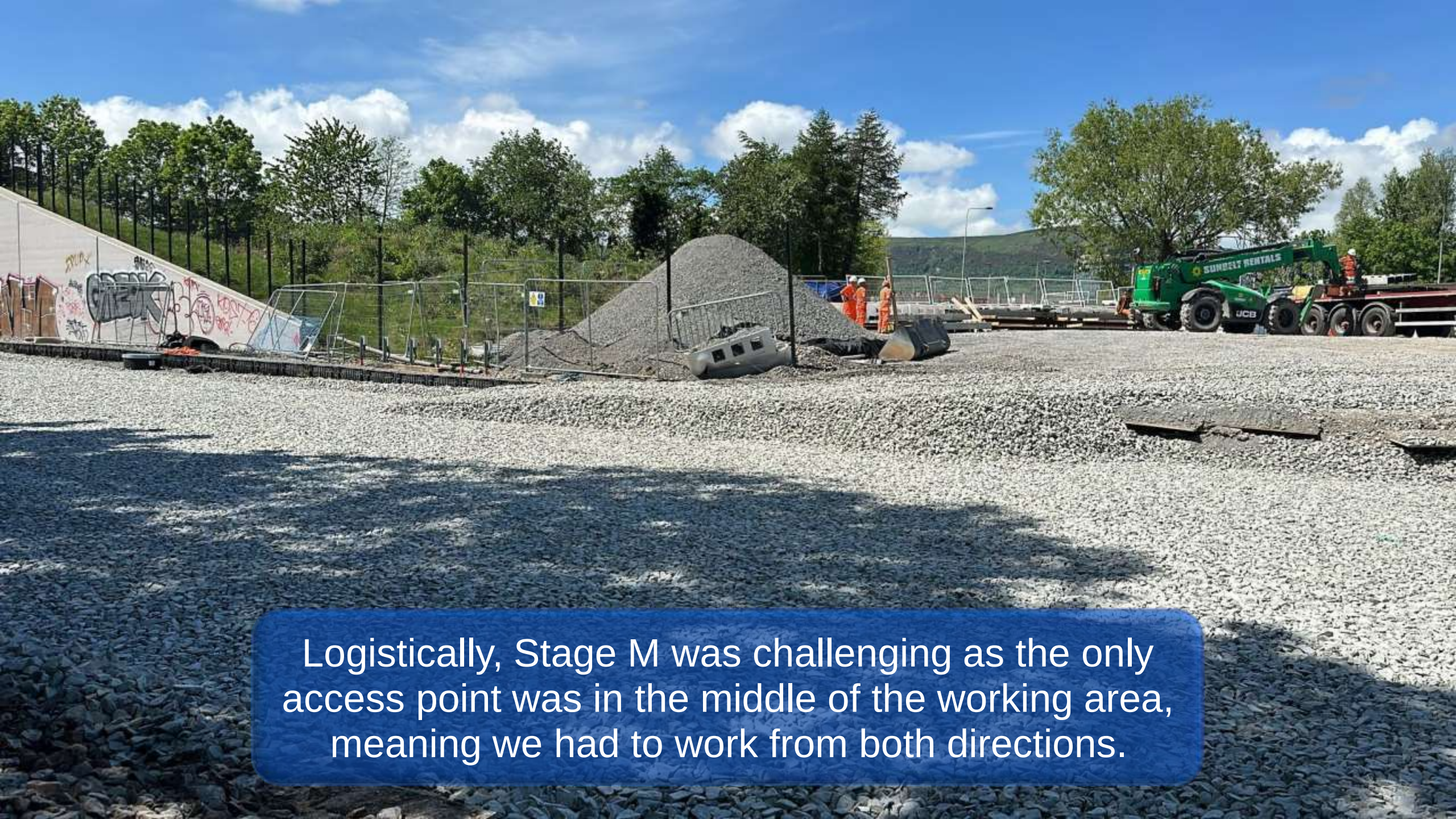


Summer Blockade – Part 1

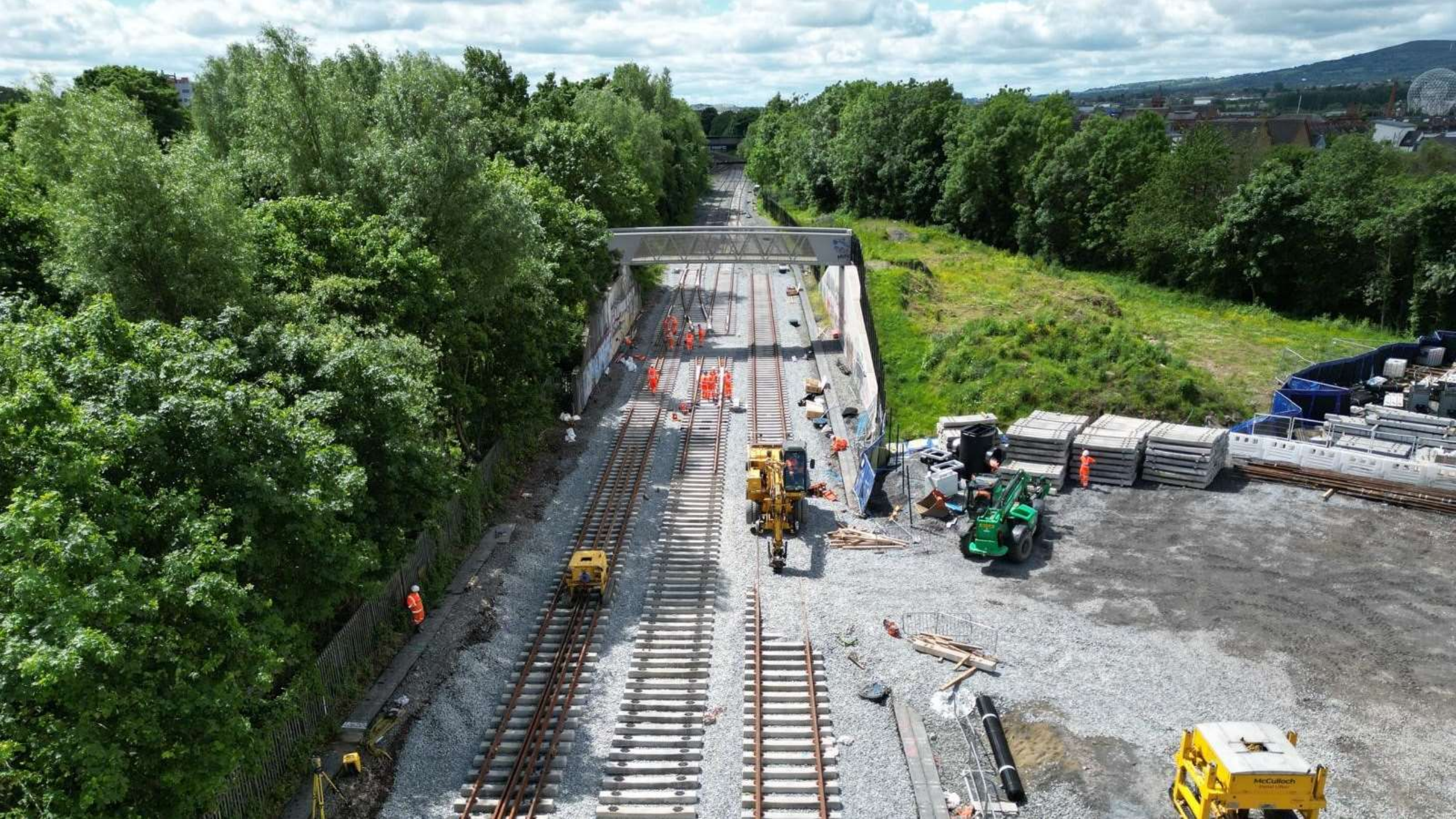
Stage M – Dublin Lines

This stage included the following works:

- Formation build up across the 3no lines including 6F, Type 1 & Terram/Geogrid
- Transitions between 2no different formation designs
- Doze bottom ballast levels
- Install approx. 800m of plain line & 779A/B Crossover



Logistically, Stage M was challenging as the only access point was in the middle of the working area, meaning we had to work from both directions.



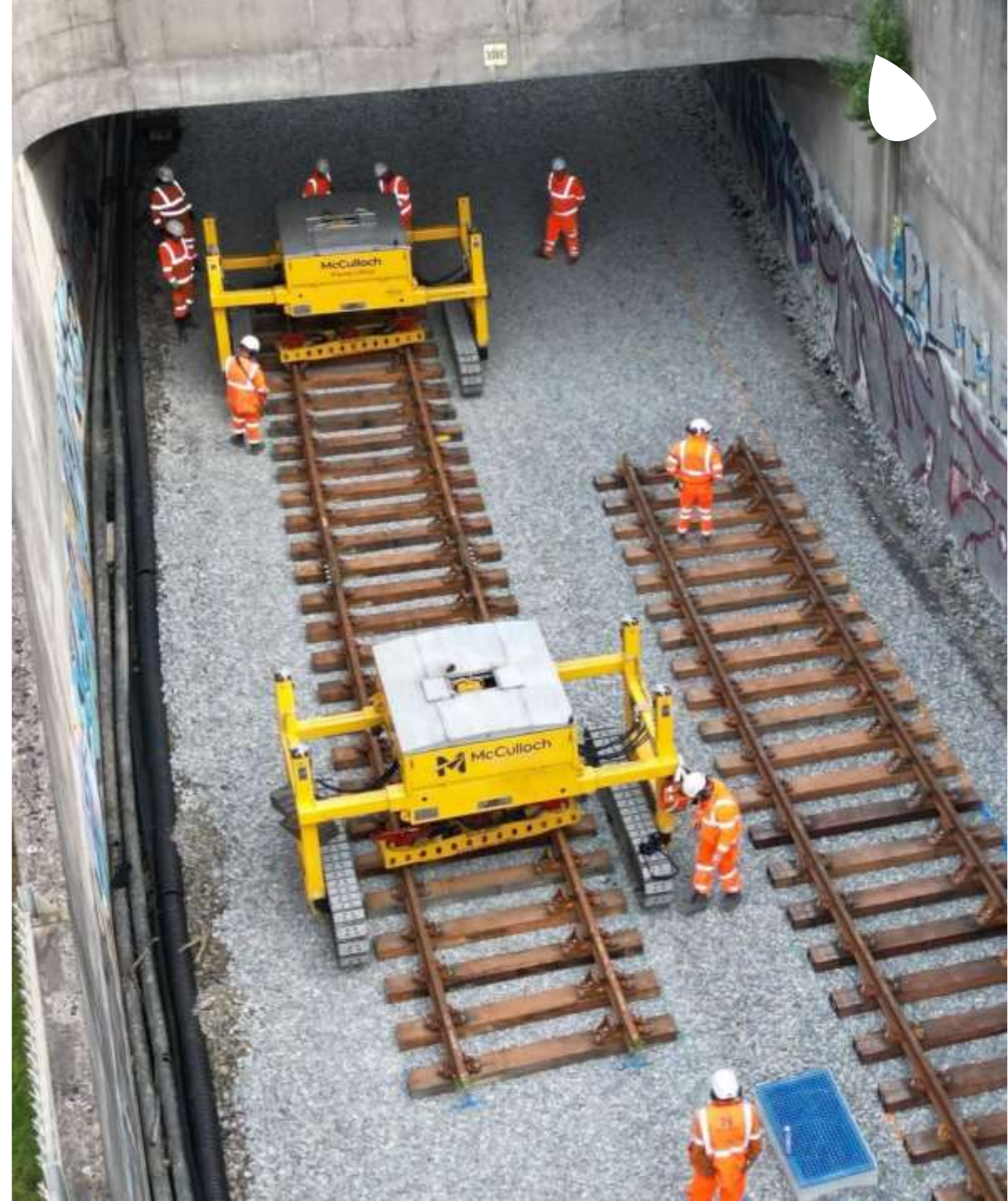


Summer Blockade – Part 1

Stage P&Q – Blythefield Lines

This stage included the following works:

- Formation build up for both the Up & Down Blythefield lines including 6F, Type 1 & Terram/Geogrid
- Transitions between 2no different formation designs
- Install 6ft Drainage
- Doze bottom ballast levels
- Install 45no pre-curved & pre-built timber panels using McCullochs panel lifters





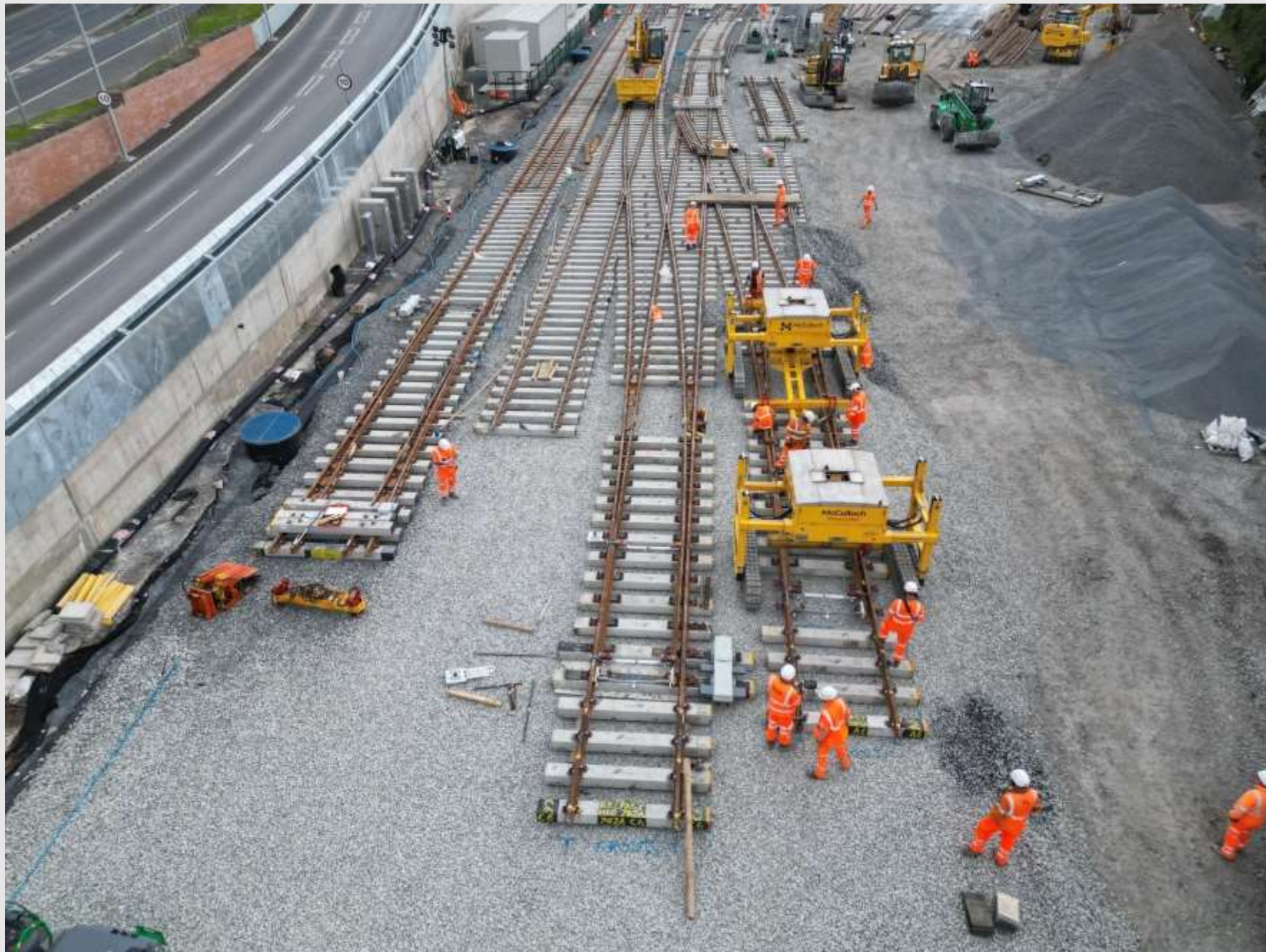


Closing the Gap

By the start of June, the Blythefield & Dublins had been installed as far as reasonably possible. With the foundation slab now complete, the process of joining the new lines into the station could commence.

This involved:

- Stoning up the entirety of the foundation slab footprint
- Installing 7no point ends including a double crossover
- Associated plain line to connect into the newly installed Dublin/Blythefield lines
- Approx. 100m of drainage







‘Closing the Gap’

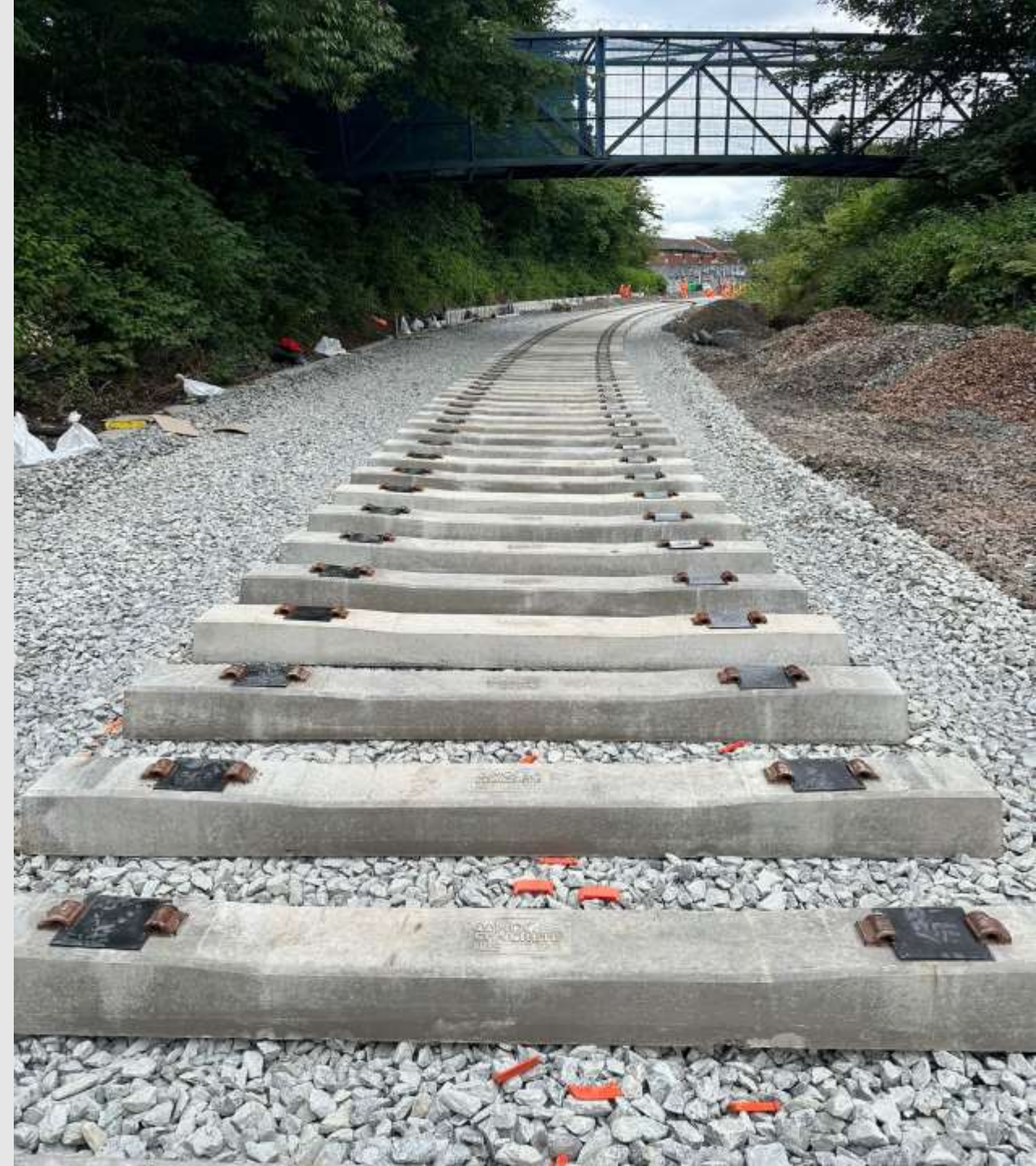
Summer Blockade – Part 2

Stage N – Central Rev

This stage included the following works:

- Re-configuring the track layout from 2no lines to 1no line for the length of the curve
- Formation build up including 6F, Type 1 & Terram/Geogrid
- Install approx. 300m of new cess drainage
- Doze bottom ballast levels
- Install approx. 300m of plain line jointed track







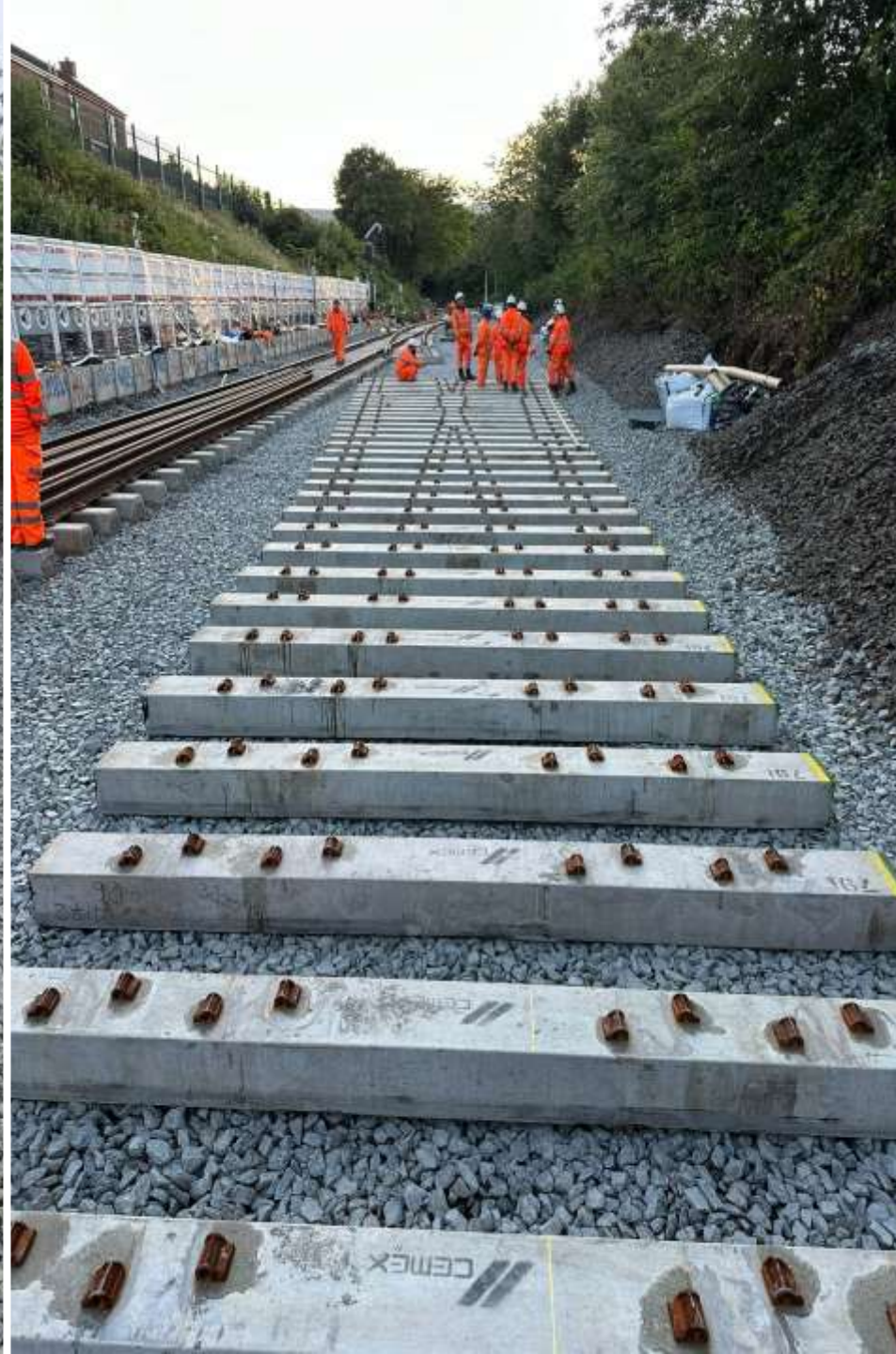


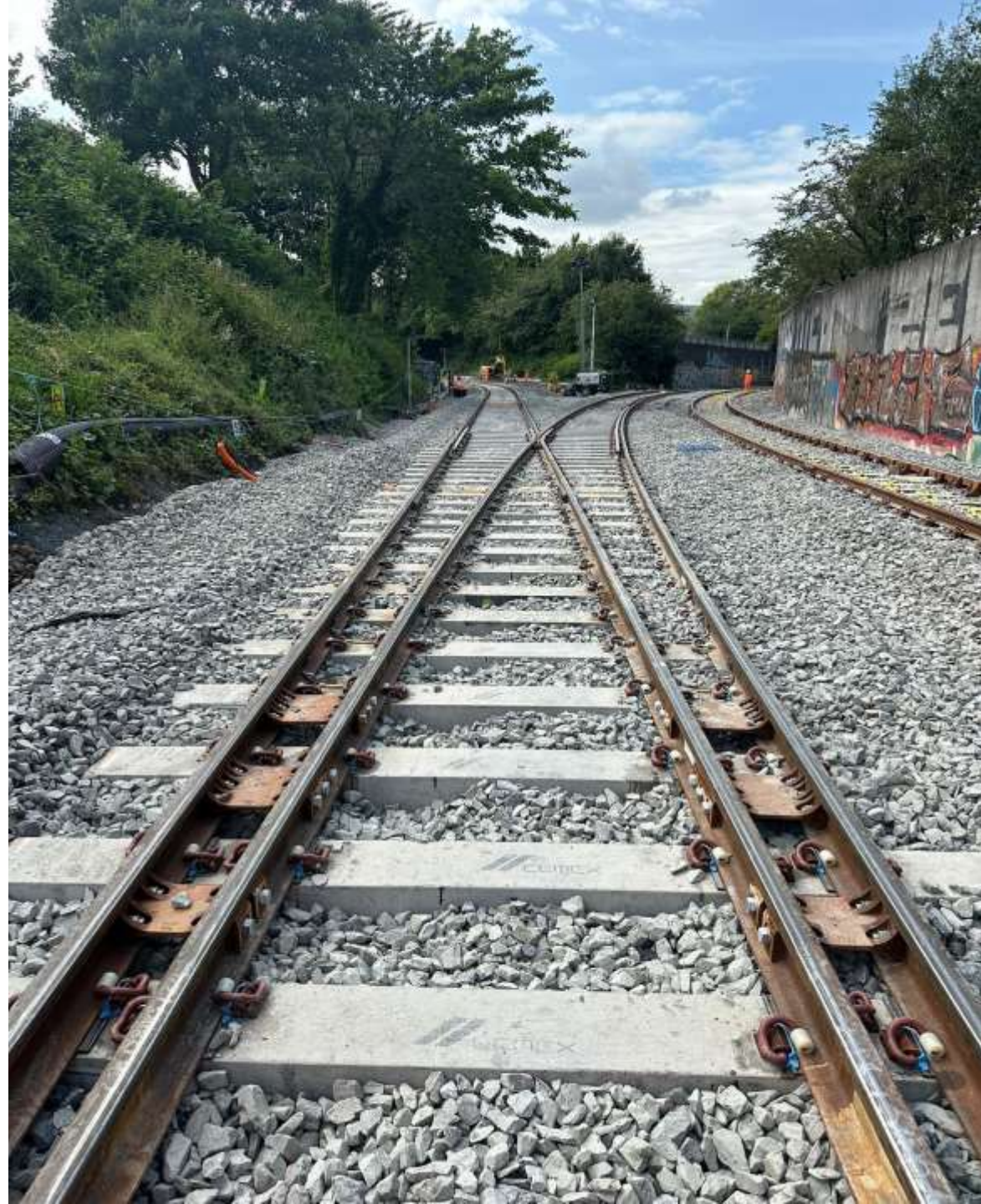
Summer Blockade – Part 2

Stage O – Up & Down Central

This stage included the following works:

- Reconfiguring the track layout to facilitate the change to a single line on the Central Rev
- Formation build up including 6F, Type 1 & Terram/Geogrid
- Doze bottom ballast levels
- Install of 790 Turnout & 791A/B Crossover and associated plain line





Blythefield Lines – Pre-Curved Panel Build

The P-Way design for the tight radius Blythefield Lines was confirmed as jointed track construction with an accompanying check rail arrangement.

This posed some factors to consider:

- Installation methodology:
 - Loose build or panelised
 - ‘Pre-Cut’ or ‘Cut to Suit’ rail lengths
- Consideration of check rail arrangements/check rail joints
- Consideration of the design gauge variation from 1600-1606
- Consideration of track layout including adjustment switch locations & IBJ types/locations
- Maintaining compliant rail lengths
- Considering differing temperatures during the construction phase and the effect on joint gap measurements

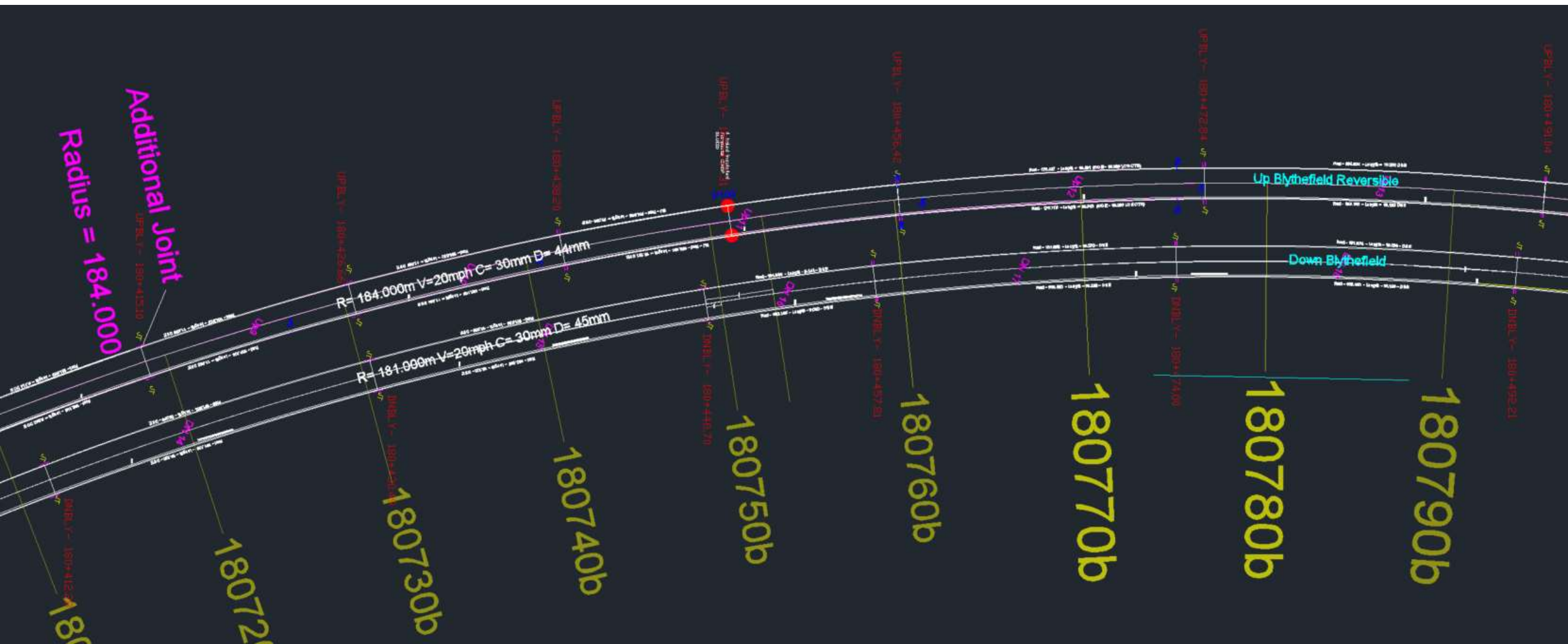
Blythefield Lines – Pre-Curved Panel Build

After much consideration, the chosen methodology was to panelise the layout.

This involved:

- Ordering pre-curved rails/IBJ's – mixture of pre-determined rail lengths and CTS to allow for some constructability tolerances
- Going back to first principles to establish leads/lags – but using CAD to design each panel and ensure accuracy when constructing
- Creating a panel schedule to ensure correct order of construction & installation
- Deciding to use McCullochs Panel Lifters – plan to install both roads concurrently working back towards the compound (low to high chainage)

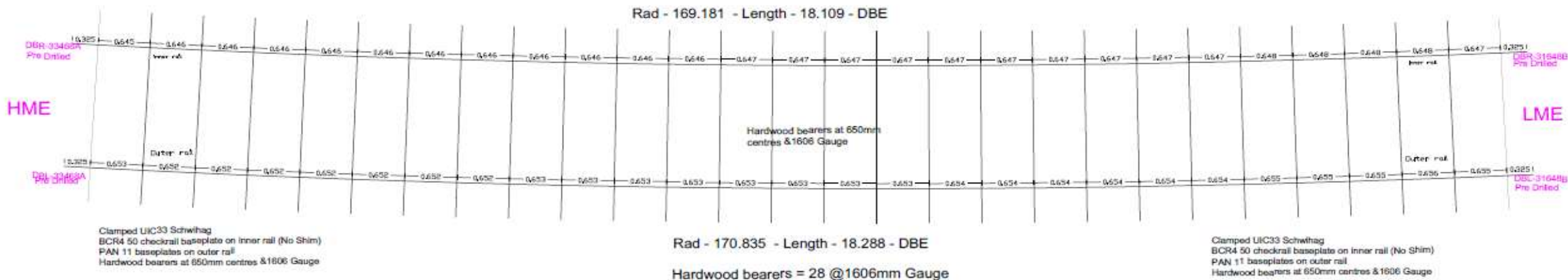
CAD Modelling



Panel Diagrams

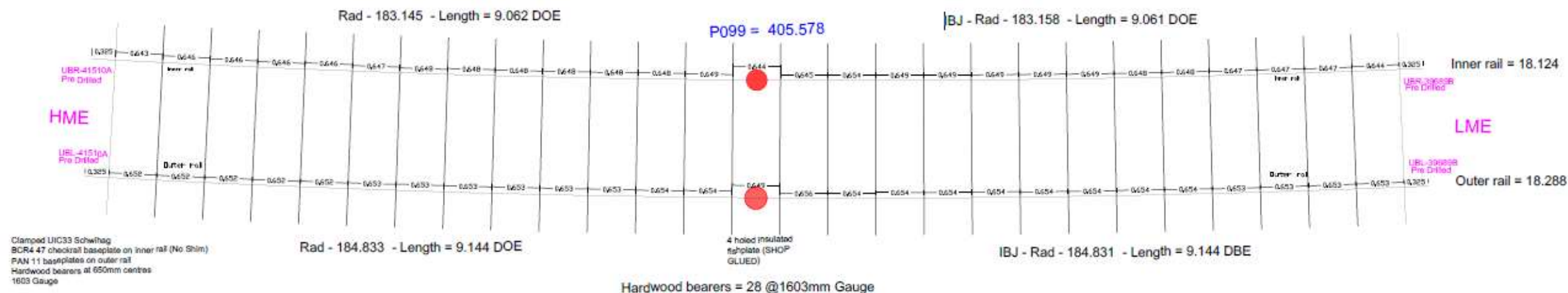
BR-SK0081- Dn Blythefield PL - Panel 08 - C01

DN 8



Up8

BR-SK0063- Up Blythefield PL - Panel 08 - C01





Logistical Challenges

The BTH project was always a logistical challenge due to its location within the heart of Belfast City Centre.

- Interfacing with the main works contractor within the station area
- Limited suitable access points and restricted sites
- Large volumes of material had to be brought in and removed through tight compound areas – no engineering trains available to remove material directly from site
- Reduced productivity rates due to the distance travelled from site to access points

Solution – we maximised plant that was available to help combat the challenges.



360 Degree Tracked Dumpers

Due to the access constraints, travelling over the formation could not be avoided. Therefor the tracked dumpers were the perfect machine to protect the formation.

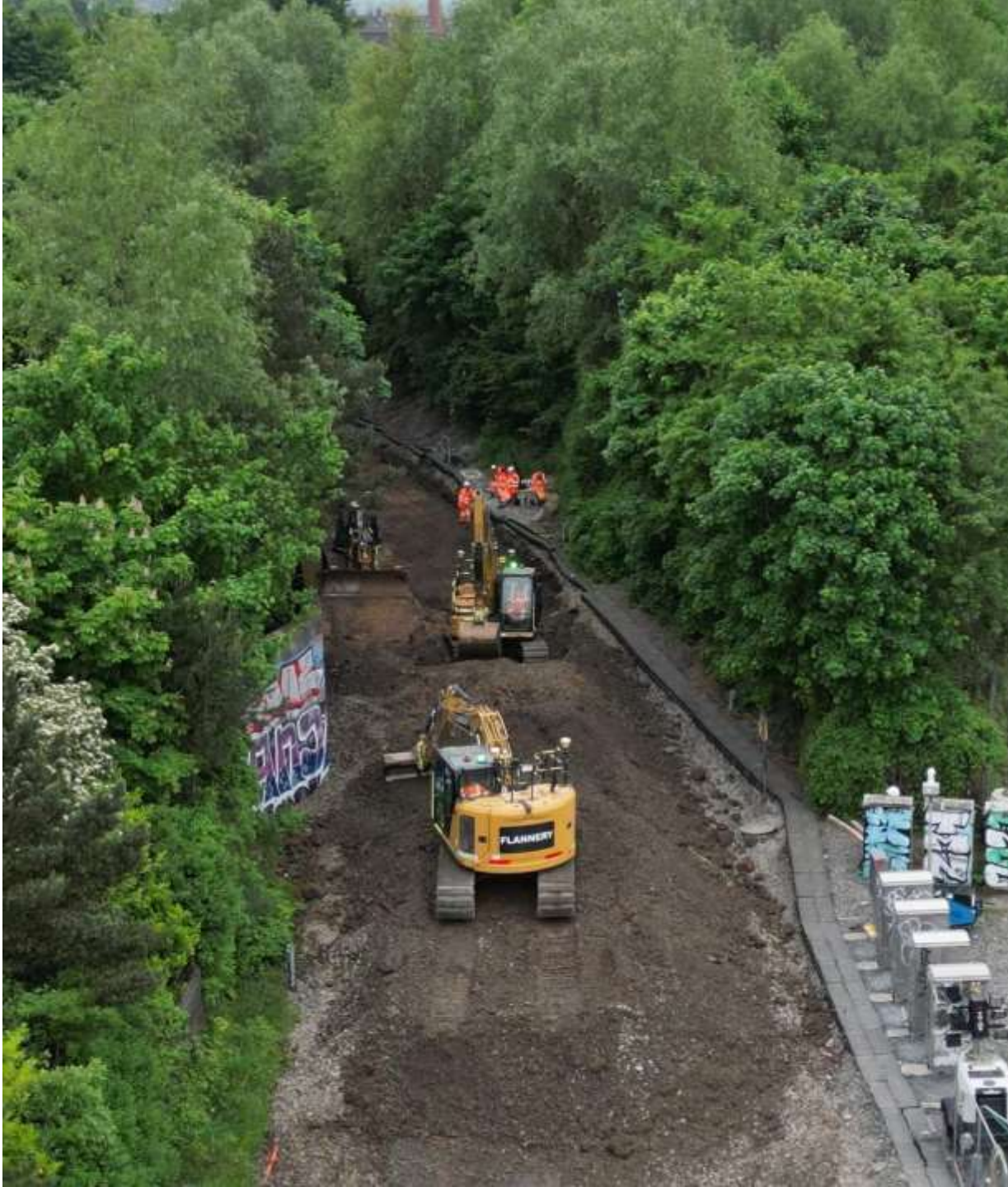
The dumpers were also capable of swiveling 360 degrees, eliminating any requirement for turning the machine when on the formation.

Unimog C/W Trailers

This was as close to an engineering train as we could achieve – this helped massively during Part 2 of summer blockade when the travel distances to compound increased

As well as being loaded with spoil, the trailers were also able to side tip ballast in front of the dozer like a conventional side tipper engineering train. They could also be used for stoning up.





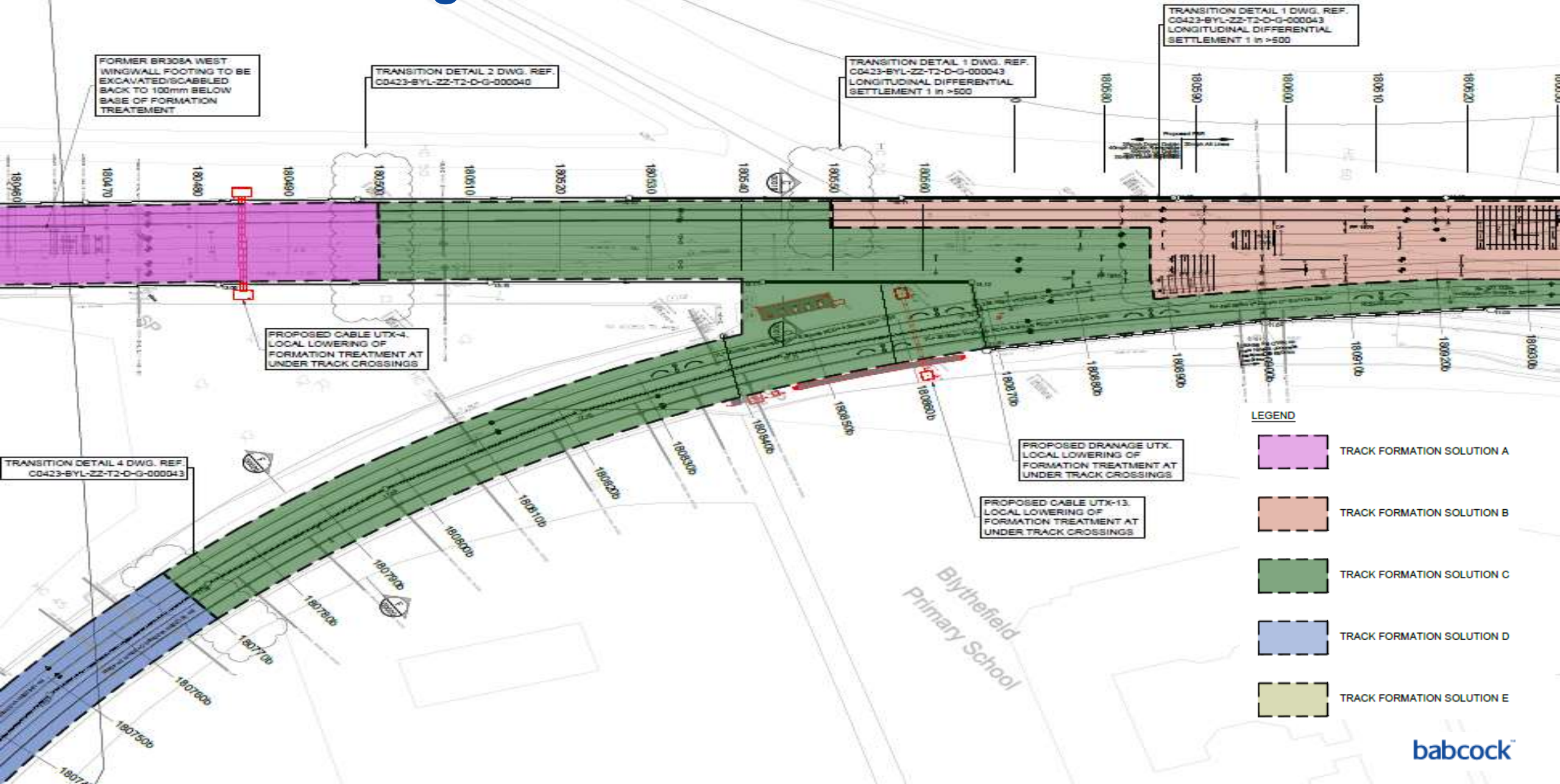
GPS Excavators

With limited space in Compounds for material and large volumes to remove, the GPS Excavators made this as efficient as possible.

The GPS machine control files eliminated the chance of over digging during the excavations. We also created drainage excavation files which increased production rates hugely.

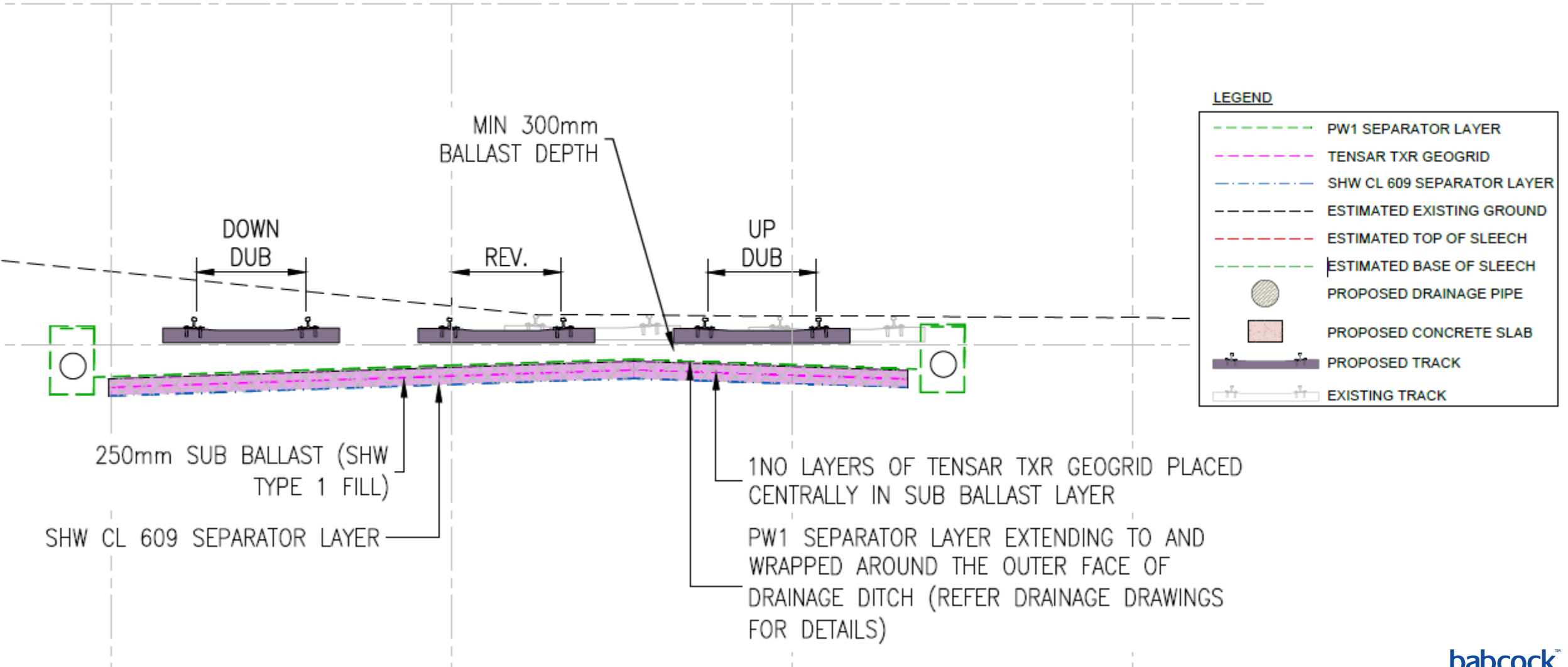
As we worked on multiple fronts during the blockade, this freed up Engineering resource as it only required spot validation checks.

Formation Design

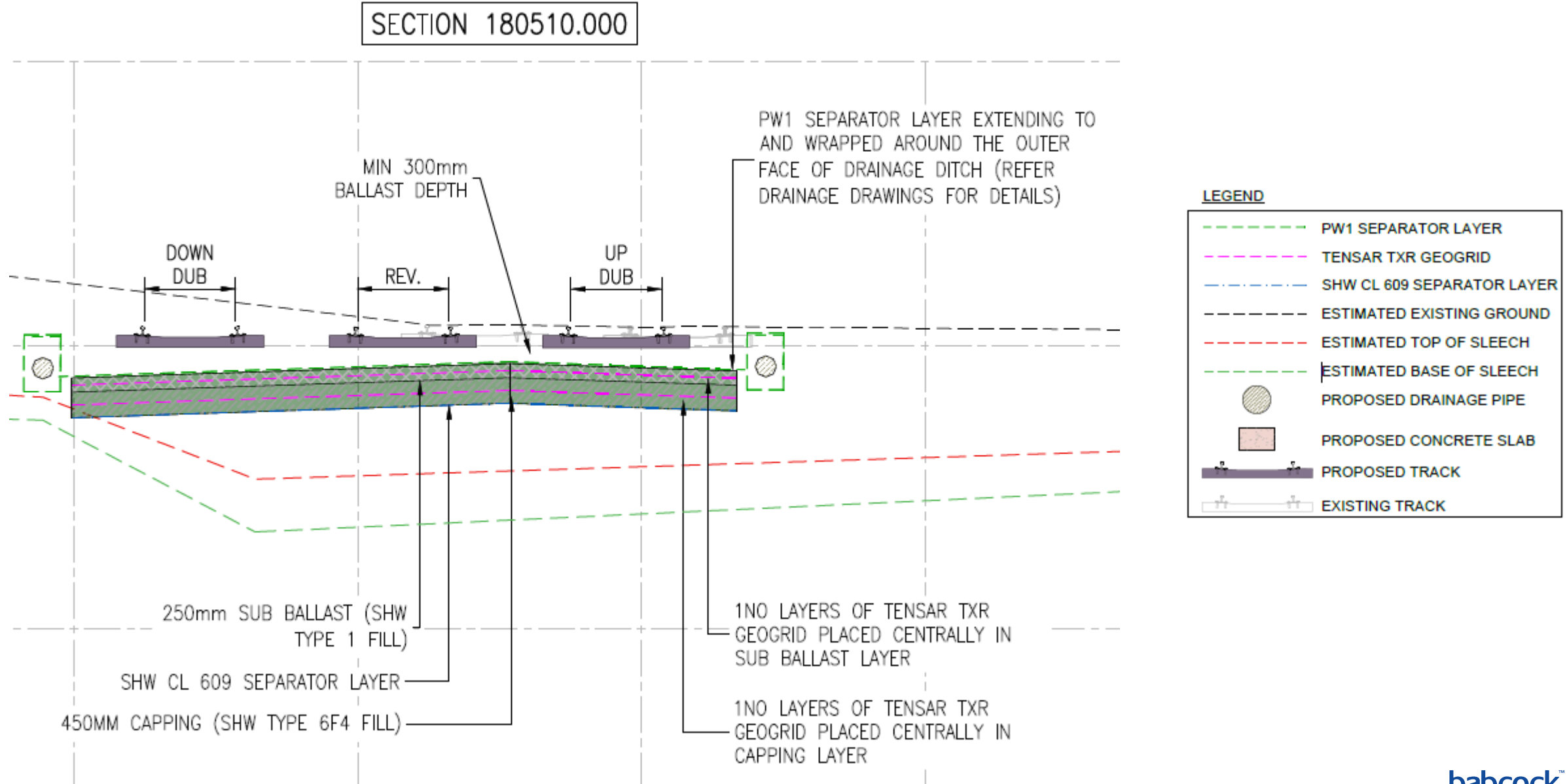


Formation Build Up – Track Formation Solution A

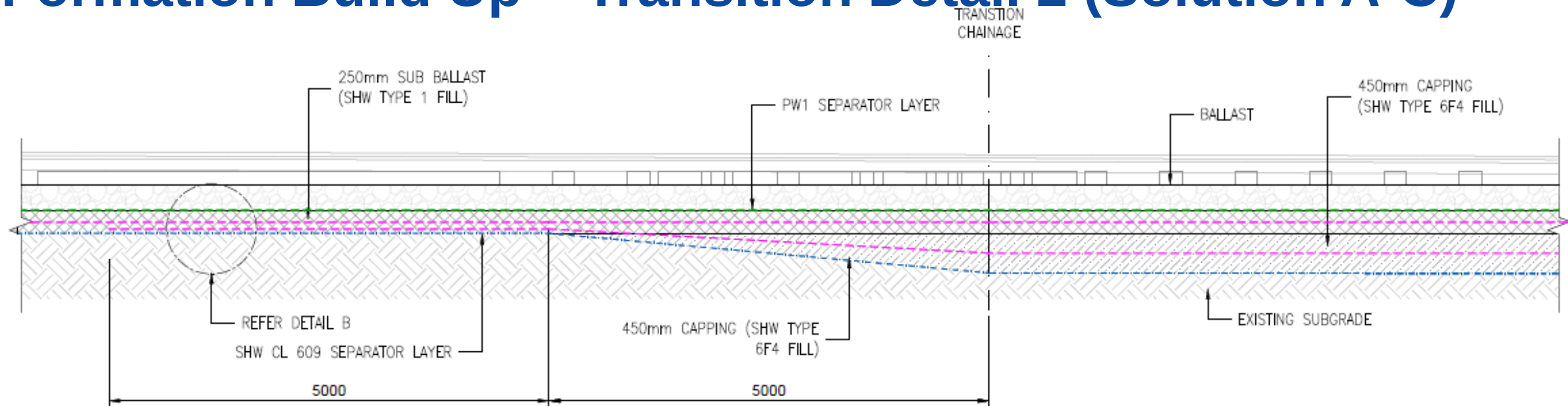
SECTION 180499.00



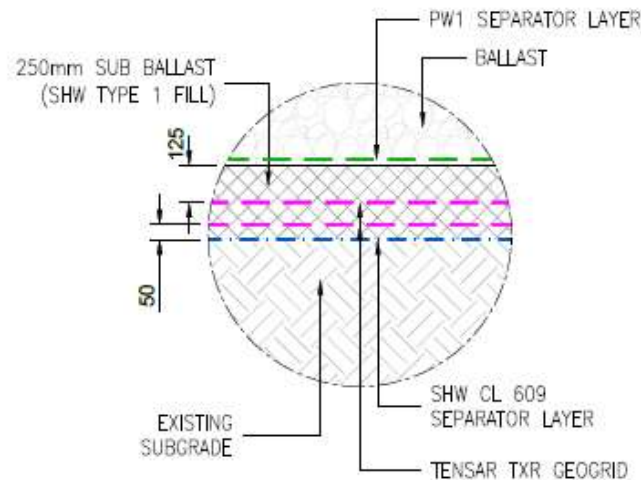
Formation Build Up – Track Formation Solution C



Formation Build Up – Transition Detail 2 (Solution A-C)



TD2 **TRANSITION DETAIL 2**
1:50 CH 180+500 DUBLIN UP/DOWN



B **DETAIL B**
1:20

LEGEND

	PW1 SEPARATOR LAYER
	TENSAR TXR GEOGRID
	SHW CL 609 SEPARATOR LAYER
	ESTIMATED EXISTING GROUND
	ESTIMATED TOP OF SLEECH
	ESTIMATED BASE OF SLEECH
	PROPOSED DRAINAGE PIPE
	PROPOSED CONCRETE SLAB
	PROPOSED TRACK
	EXISTING TRACK

Permanent Way and Civil Engineering Metrics



Belfast Transport Hub - Civils

‘Largest integrated transport hub on the island of Ireland’

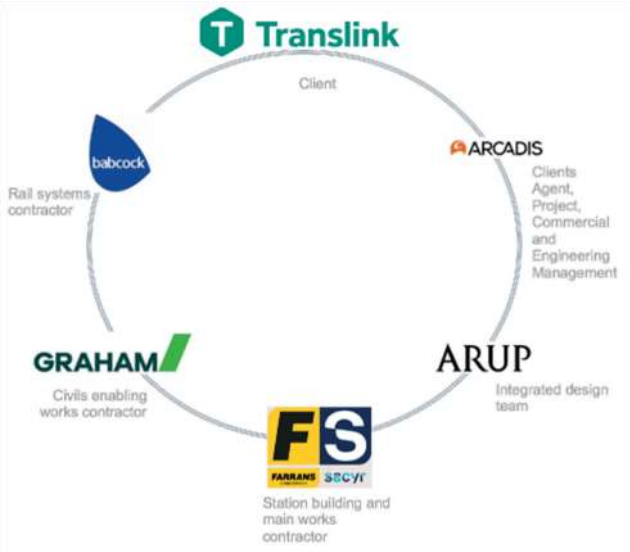


Ryan McCoy – Senior Civils Project Engineer

babcock

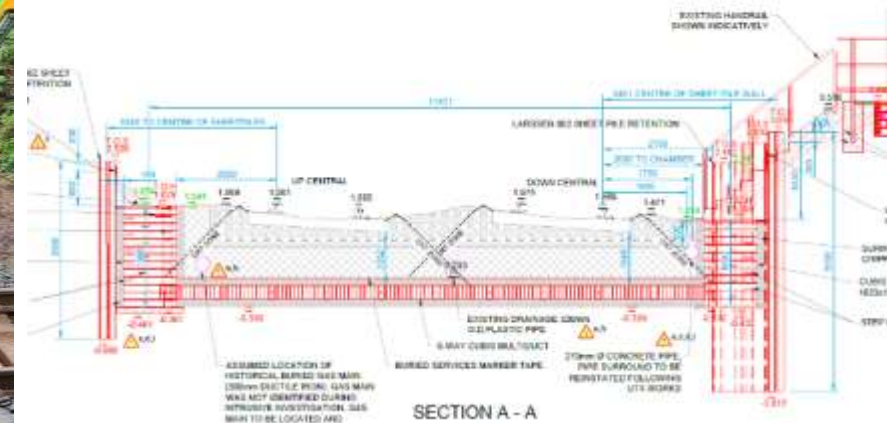
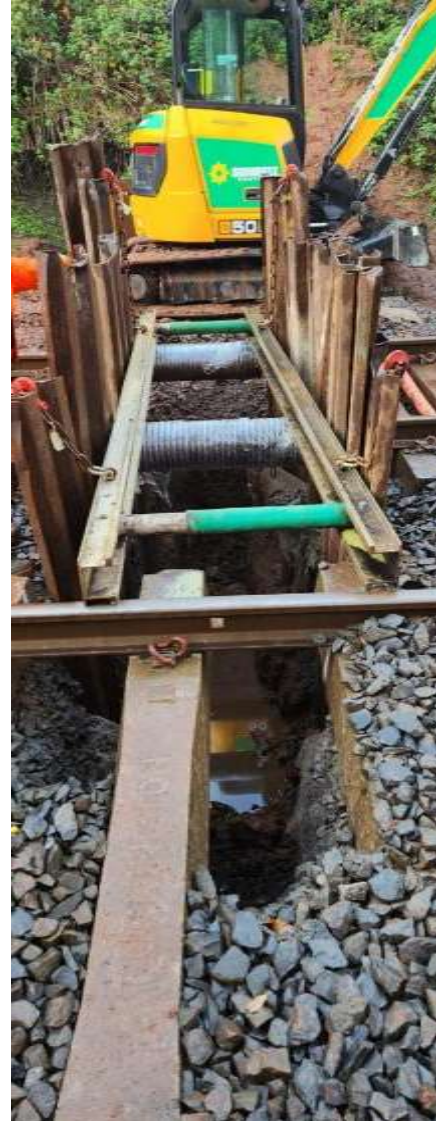
Introduction

£340m project capable of catering for up to 20 million passengers



Ancillary Civils

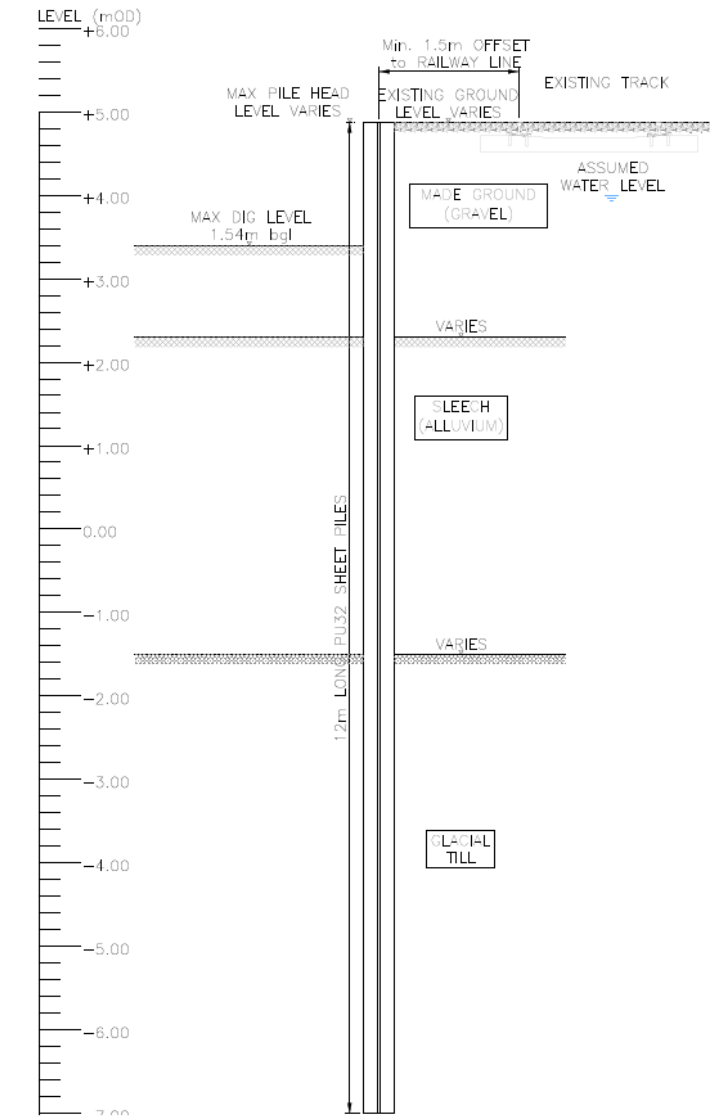
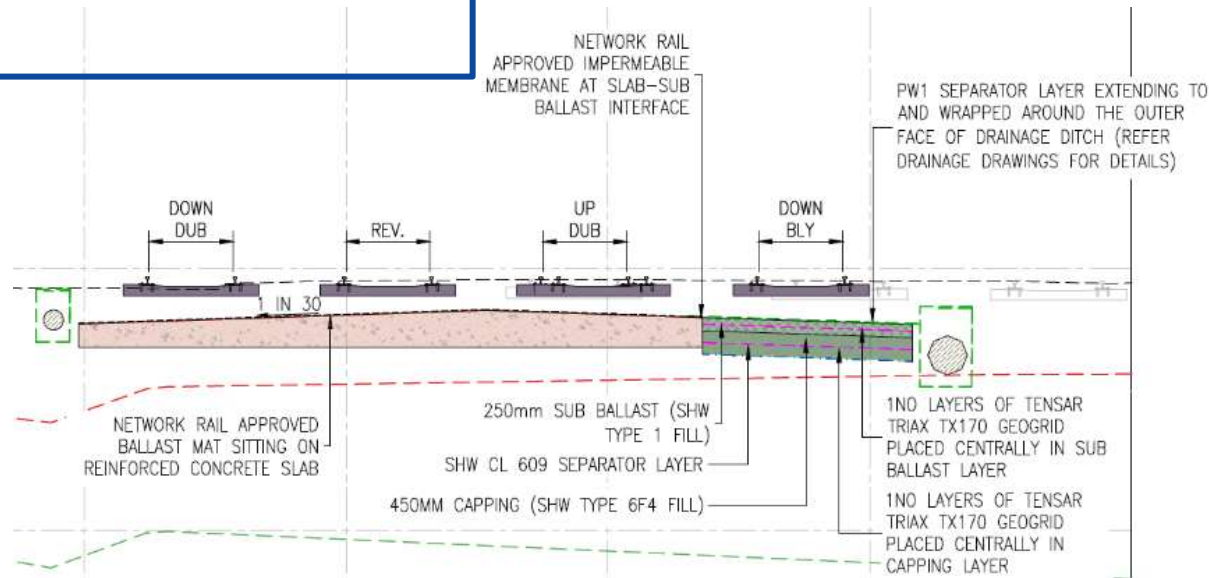
- 9 Under Track Crossing (UTXs)
- Retention works
- 8km of lineside cable route, housing 65km of cabling
- 1800m of Drainage works split between Civils and Pway
- 25 Signal bases
- 2 Signal Gantries
- 28 LOC suites including 20 FSPs – Functional Supply Point
- 2 PSP – Principal Supply Point
- 78 control equipment bases



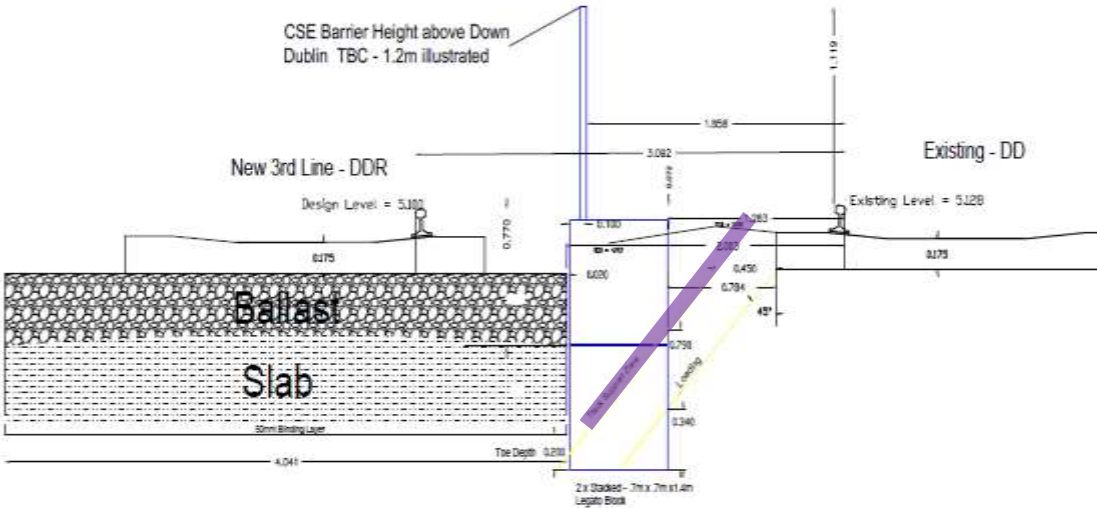
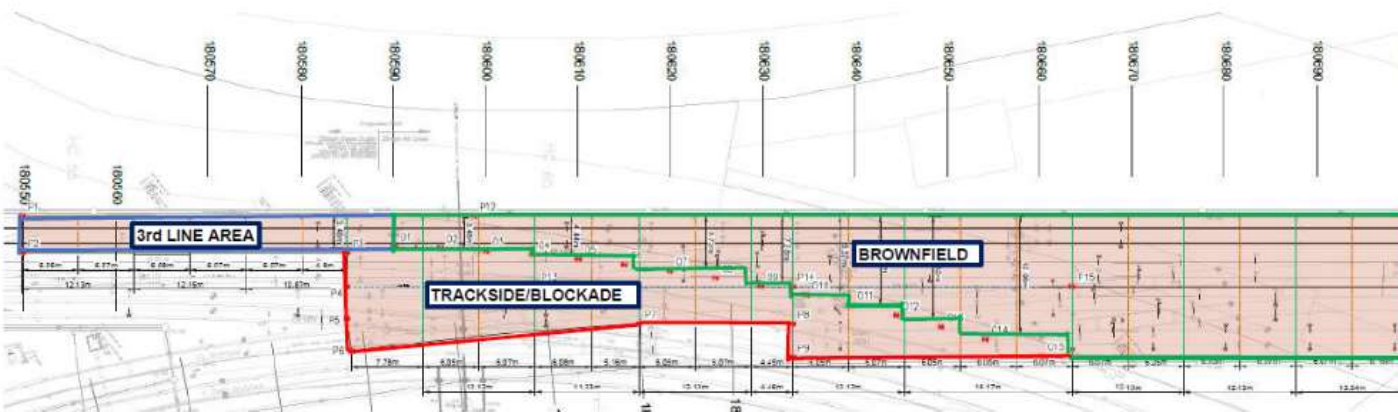
Foundation Slab

Reinforced Concrete Slab

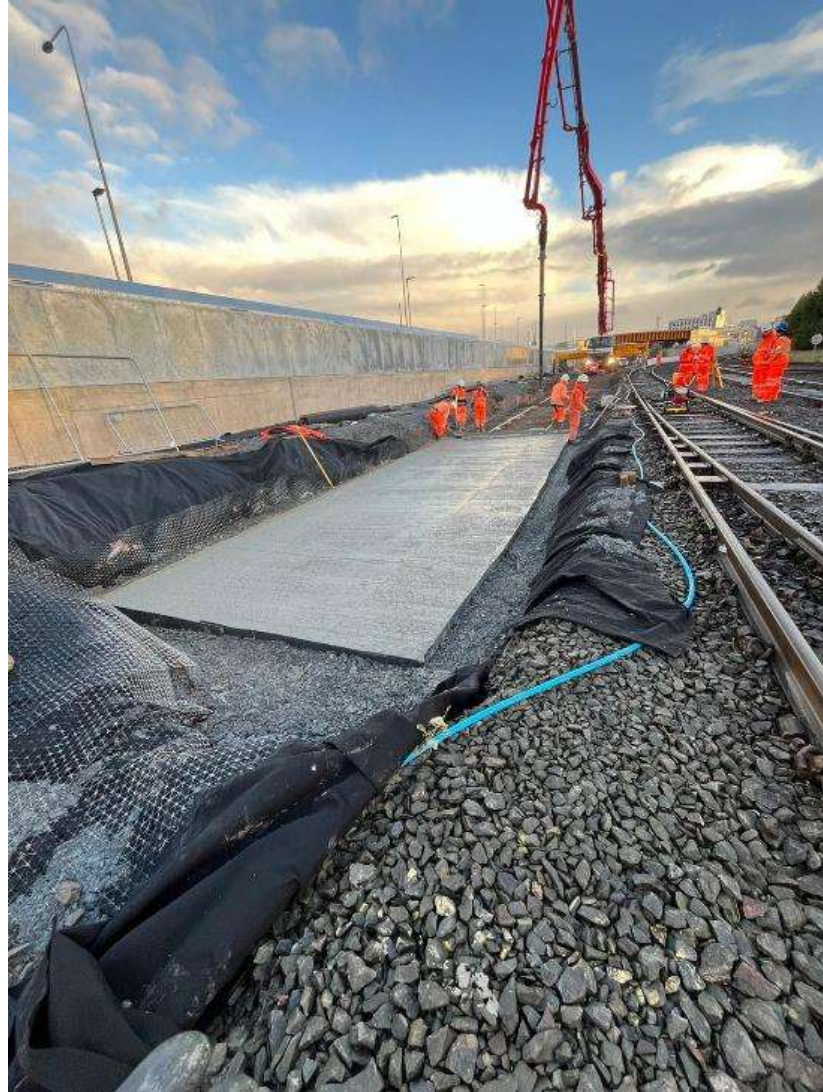
- 1795m² of concrete reinforced slab
- Over 1000m³ of concrete poured
- 135T of steel
- 800 Ancon Couplers
- Depths between 450mm & 700mm



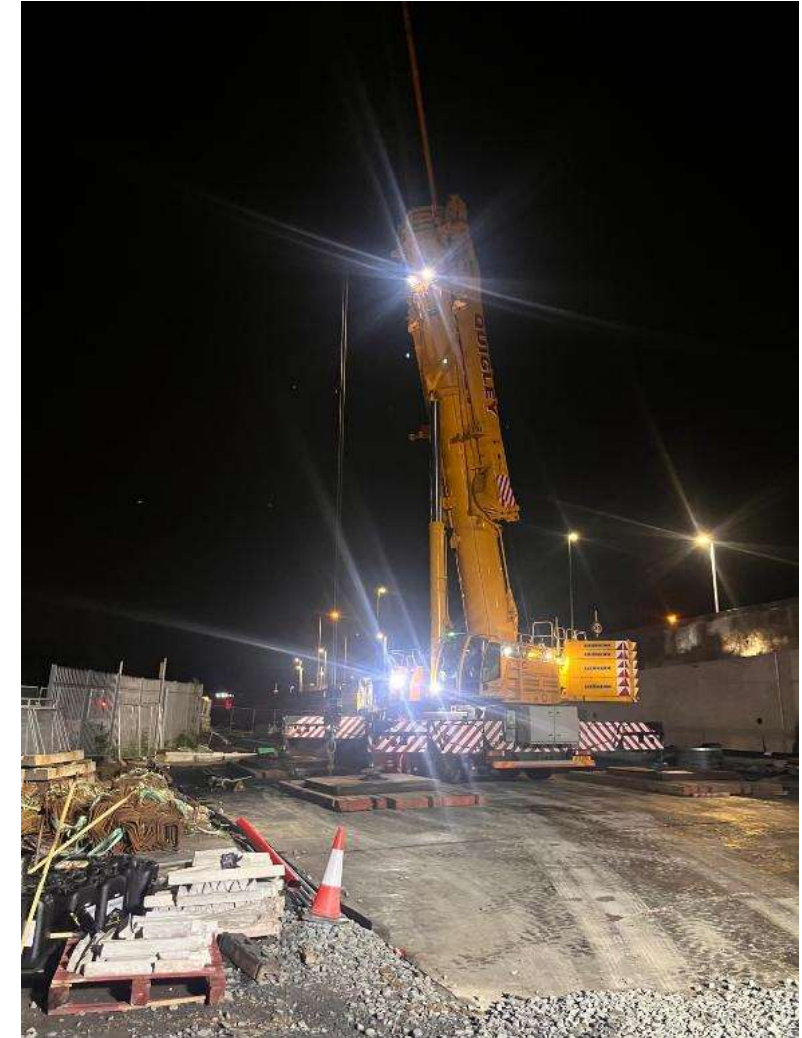
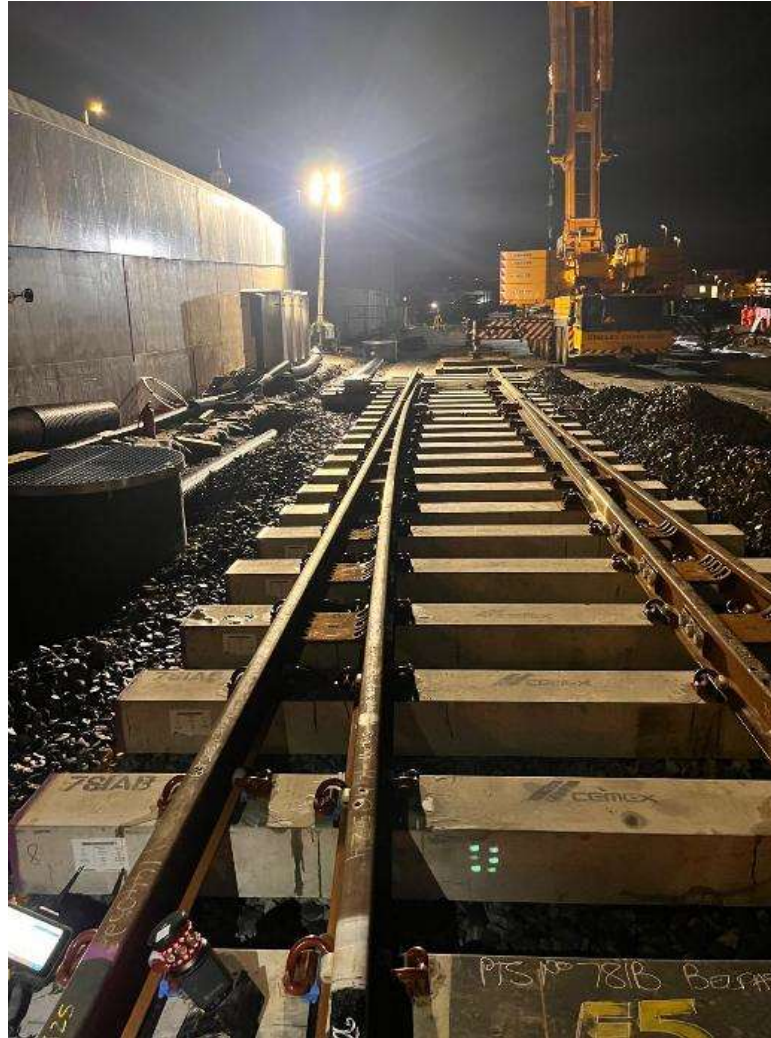
Foundation Slab



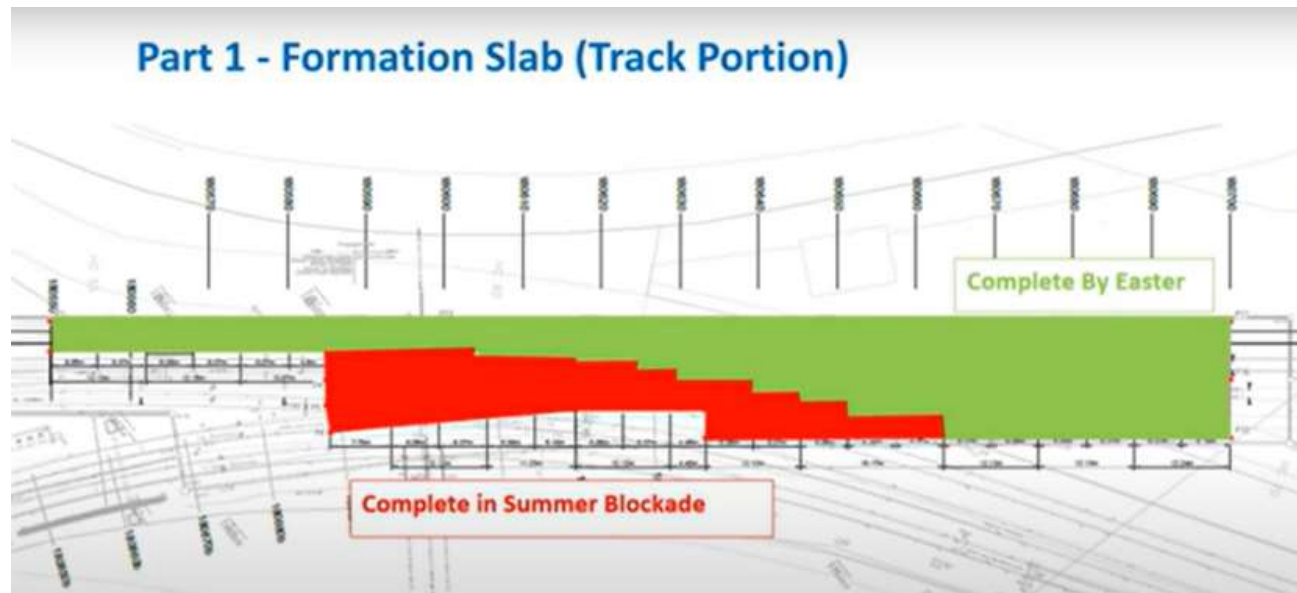
3rd line area & Christmas Blockade



Foundation slab - brownfield



Foundation slab – ‘the bottleneck’



Conclusion

NIROC – Northern Ireland Railways Operating Centre

Contract value: £6m



“The project teams have worked tirelessly, meticulously, and collaboratively, with passion, pride, and professionalism to achieve a significant piece of history for Northern Ireland.”

Duncan McAllister, Head of Belfast Grand Central Station and Weavers Cross Programmes (2024)

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