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WINNER OF THE RAIL BUSINESS AWARDS 2024 INFRASTRUCTURE PROJECT & STATION EXCELLENCE CATEGORY

GOSFORTH DEPOT REMODELLING: MODERNISING A CENTURY-OLD MAINTENANCE FACILITY

KNOWLEDGE 200 TRACK

KNOWLEDGE 200 ELECTRIFICATION & PLANT

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Figure 1: Modernised Gosforth Depot (Image courtesy of Stadler Rail).

ABSTRACT

The renewal of railway maintenance depots presents distinct engineering challenges, particularly where modern operational, safety and electrification requirements must be delivered within constrained brownfield sites while maintaining live operations. Gosforth Depot, located on the Tyne and Wear Metro network, required comprehensive remodelling to support the introduction of a new fleet of Stadler Class 555 metro vehicles, while continuing to service the legacy Class 599 fleet throughout construction.

This paper presents the permanent way and overhead line electrification (OLE) elements of the Gosforth Depot Remodelling project, following the full lifecycle from design development through staged construction and commissioning. Emphasis is placed on resolving geometric and spatial constraints, the selection of appropriate track forms and switches and crossings, the development of a depot specific 1500 V d.c. double insulated OLE system, and the integration of temporary and permanent works to maintain operational continuity. The lessons identified are applicable to similar depot renewal projects undertaken within constrained operational environments.

1. INTRODUCTION

As part of a wider Nexus network investment programme between 2010 and 2021, the Tyne and Wear Metro network underwent significant renewal works, including track renewals and upgrades to power and associated structures. As part of this programme, Stadler Rail was awarded a £362 million contract to supply and maintain forty-six new Class 555 metro vehicles. The introduction of the new fleet required the provision of a modern maintenance facility capable of supporting revised maintenance, inspection and stabling requirements.

As part of the bidding and procurement process, Stadler was required to deliver a new £70 million maintenance depot on the existing Gosforth site (pictured, **Figures 1)**. VolkerFitzpatrick was appointed as the Principal Contractor for construction of the new facility, with Arcadis appointed as the Principal Designer responsible for the multidisciplinary permanent way and systems design.

The new depot was required to be delivered within the constrained footprint of the existing Gosforth Depot while maintaining operational capability for the legacy Class 599 fleet for the majority of the construction period. This introduced significant geometric, spatial and operational challenges, particularly in relation to permanent way layout, switches and crossings, overhead line electrification and construction staging.

This paper presents the permanent way and overhead line electrification (OLE) elements of the Gosforth Depot Remodelling project. It describes the development of the depot layout and infrastructure from concept design through staged construction and commissioning, focusing on the design decisions that enabled continuous depot operation within a complex, live railway environment.

2. SITE LOCATION AND OPERATIONAL CONTEXT

Gosforth Depot is located to the north of Newcastle upon Tyne on the Tyne and Wear Metro network, within a constrained 'Y'-shaped junction between the routes serving Regent Centre, Longbenton and South Gosforth stations (**Figures 2** and **3**). The 12-acre site has been in continuous use as a railway maintenance facility for around a century.

Initially constructed in the 1920s, the depot supported successive generations of Metro rolling stock and, from the 1980s, served the

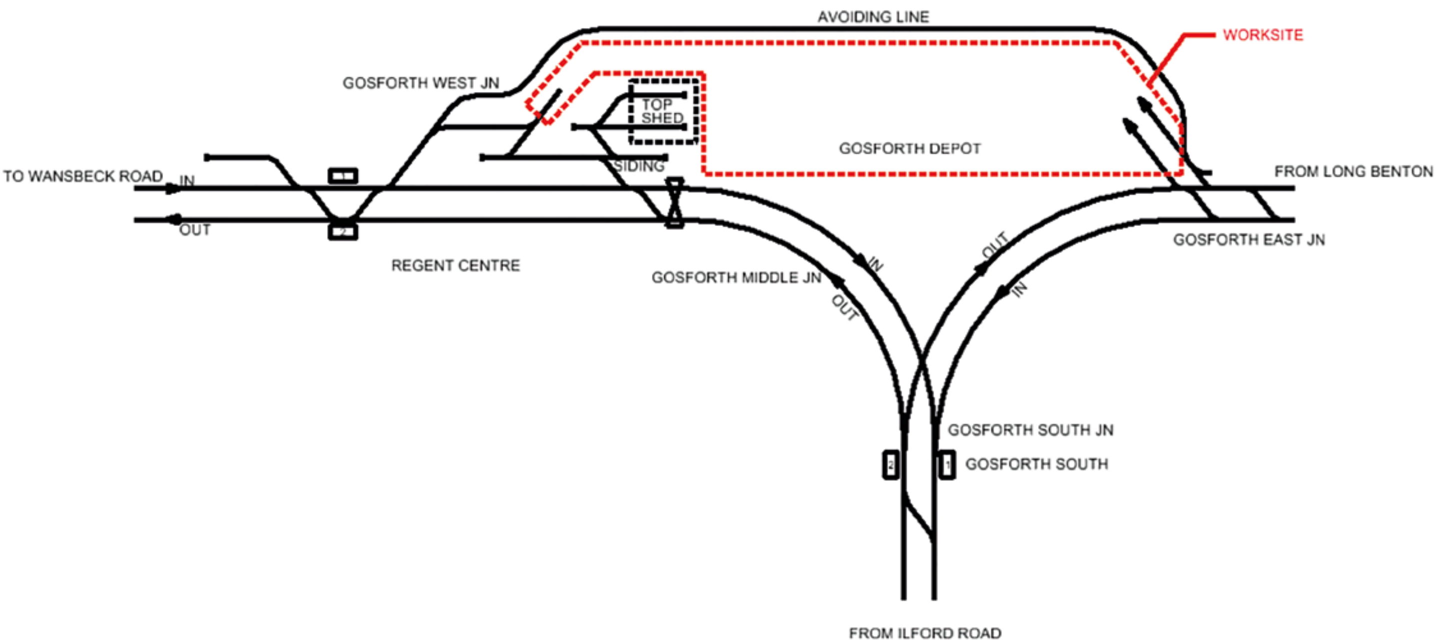

Figure 2: Line diagram showing Gosforth Depot location within the Tyne and Wear Metro network.

Figure 3: Google Earth aerial image showing the depot site and surrounding junction context.

Class 599 fleet. Over time, the infrastructure was incrementally modified to accommodate evolving operational and maintenance requirements. However, by the start of the project, both the depot facilities and the legacy rolling stock were approaching the end of their service lives, necessitating comprehensive modernisation to support the introduction of the new fleet.

3. PROJECT SCOPE AND FUNCTIONAL REQUIREMENTS

The remit of the Gosforth Depot Remodelling project was to deliver a fit-for-purpose maintenance facility bespoke to the new Stadler Class 555 metro vehicles, while remaining semi-operational and capable of servicing the legacy fleet during its gradual replacement. The new depot was required to incorporate a range of specialist facilities, including a carriage wash machine (CWM), automated vehicle inspection system (AVIS), wheel lathe, underframe cleaning (UFC) facility, and a main facilities building capable of supporting both light and heavy maintenance activities. In addition, the final layout was required to provide stabling capacity for up to forty-six Stadler Class 555 vehicles.

The project scope also included replacement of all existing overhead line electrification (OLE) structures, wiring and switching equipment within the depot limits, together with the provision of new electrified tracks throughout the depot. All new and retained tracks were required to be electrified at 1500 V d.c. using a double-insulated OLE system suitable for depot environments.

Permanent way design was required to satisfy Stadler vehicle requirements for minimum horizontal radii, maximum gradients and operational clearances, while complying with Nexus permanent way standards, which are predominantly, though not exclusively, based on Network Rail standards [**1,2,3**]. OLE design was developed in accordance with Stadler requirements and Tyne and Wear Metro electrification and traction power standards [**4**].

4. EXISTING INFRASTRUCTURE AND CONSTRAINTS

Approaching the depot from the west via the reception and wash line, the track layout fanned out into eighteen sidings. Thirteen of these served the main maintenance shed, while a further five sidings located to the south of the shed provided fuelling and general stabling. At the eastern end of the site, all depot roads converged to form dual reception and departure lines connecting back to the operational network. The depot was dominated by the existing maintenance building and associated facilities, including offices, a signalling control centre, paint shop and stores, which occupied approximately 3.5 acres, representing around 37 per cent of the 12-acre site.

Reflecting the long operational history of Gosforth Depot, permanent way componentry varied significantly across the sidings as a consequence of periodic renewals and maintenance undertaken over several decades. Rail assets comprised a mixture of bullhead and flat-bottom rail sections of differing ages and wear. Correspondingly, sleeper arrangements included both timber and concrete units, with bullhead chair systems used where appropriate. Within the maintenance shed, track support configurations differed according to operational function, with rails either directly fixed to the floor slab via baseplates or supported on pedestals or pit walls to facilitate specific maintenance activities.

The depot layout comprised a total of twenty-nine turnouts, including a combination of bullhead and flat-bottom AV and BV units. At the western end of the depot fan, an equal-split tandem turnout formed part of the layout, while a bullhead scissors crossover was installed at the eastern end on the tightly curved arrival and departure lines.

Figure 4: View facing west between existing depot road 18 and 19 highlighting the southern embankment.

These arrangements introduced geometric complexity and influenced both design development and construction staging.

To the north of the depot, a bi-directional avoiding line provided an operational route allowing trains to bypass the depot, enabling services from the west, including the Newcastle Airport branch, to operate directly to the east and vice versa without the need for reversal at South Gosforth station.

The Tyne and Wear Metro system is electrified at 1500 V d.c. using a proprietary system design dating back to its introduction in 1980. Across the wider network, the overhead line electrification (OLE) system utilises a combination of simple auto-tensioned and fixed-termination arrangements. Within Gosforth Depot, the existing OLE was subdivided into multiple independently isolatable electrical sections, with sectioning controlled from the Central Gosforth control room. Depot electrification comprised predominantly single-insulated, tramway-type equipment utilising multi-track span wire arrangements, with all OLE structures bonded to the traction negative return rail.

5. DESIGN CONSTRAINTS AND CHALLENGES

Like all brownfield rail infrastructure projects, the remodelling of Gosforth Depot was subject to a range of site-specific design constraints. In this case, the constrained site geometry, the requirement to maintain depot operations, and the need to accommodate potential future network enhancements presented particular challenges during design development.

As part of the project remit, provision was required to safeguard space for the future dualling of the northern avoiding line, intended to increase traffic capacity to the Newcastle Airport branch. Although the design of the dualling alignment and associated junction alterations lay outside the project scope, an understanding of its interface with the depot was required. A feasibility study was therefore undertaken to inform the setting-out of the northern perimeter fence line and protect future enhancement opportunities.

Retention of the existing wash and reception road as the primary western access point for depot movements imposed a critical vertical alignment constraint. The legacy reception line fell at a gradient of approximately 1:65 from west to east. Extending this gradient through the western fan would have placed a vertical curve within the long bearers of the turnouts, which was not considered acceptable. Raising the overall depot level by approximately 1.2 m to eliminate the gradient was discounted at an early stage due to the significant volume of fill required across the 12-acre site, the consequential impact on programme and cost, and the need for extensive junction works at Gosforth East. Instead, the spacing between turnout units at the start of the fan was adjusted to allow a change in gradient, flattening the profile to approximately 1:139 and relocating the vertical curve outside critical bearer zones, while maximising flat track length ahead of the wheel lathe building slab.

To the south of the western reception road, differences between the falling depot gradient and the relatively flat adjacent main line and top shed tracks resulted in a level differential. This required a retaining wall and embankment extending along the southern boundary of the site, containing high-voltage services identified during buried services assessments (**Figure 4**).

At the eastern end of the depot, the avoiding line rejoined the running lines near a pedestrian footbridge, immediately upstream of existing traps and turnout long bearers associated with Gosforth East Junction. To maintain signalling functionality, the turnout position could not be altered, requiring any new arrival and departure tracks to be geometrically tied in ahead of this interface.

The positioning of key operational facilities, including the main facilities building, wheel lathe, carriage wash, AVIS and underframe cleaning facility, was considered prior to detailed alignment development. An internal highway was aligned along the base of the southern embankment, corresponding broadly with the alignment of Roads 18 and 19, enabling efficient deliveries and staff access without the need to cross live depot lines. These locations were treated as fixed points, requiring close coordination between disciplines to ensure functional and geometric compatibility.

OLE design was similarly influenced by operational constraints. Depot roads were grouped into electrical sections, typically comprising pairs or groups of three or four roads, divided into east and west zones. Each road within the central depot sections retained an individual feed, while the fan arrangements were configured to allow alternative feeding scenarios. This rationalised sectioning strategy improved isolating safety, maintained access to switches, and allowed the majority of the depot to remain operational during isolations.

Finally, construction logistics imposed additional constraints. The depot's location within a three-junction 'Y' formation, combined with a heavily urbanised surrounding environment, limited access for large deliveries. Narrow, predominantly single-lane access roads, often constrained by on-street parking, and proximity to schools along Christon Road necessitated careful management of material quantities and vehicle movements, with minimising the use of heavy wagons identified as a key priority.

6. DESIGN DEVELOPMENT AND FINAL LAYOUT

6.1 Site Layout Development and Building Integration

With the key site constraints understood, the tender design was developed using the site topographical survey and progressed through coordinated discussions with the design disciplines, construction team and client. This process was undertaken to refine the locations of the main facilities building (MFB), underframe cleaning facility (UFC), carriage wash (including plant room) and wheel lathe.

To support the project remit and construction staging strategy, the location of the MFB was carefully selected to allow continued operation of the existing Class 599 fleet, which at this stage in its service life required ongoing maintenance. The final MFB location, situated in the south-east corner of the site, enabled construction to proceed by clearing a large area of predominantly plain-line track and a limited portion of the existing shed, while maintaining operation within the remainder of the facility. This location fixed the positions and track centres of the four service roads within the MFB, comprising two light-maintenance roads and two heavy-maintenance roads.

Using the MFB road layout, together with the associated access road and car park, the remaining depot tracks were set out to provide appropriate clearances for walkways and operational activities such as front-end cleaning and driver inspection. With four final berths provided within the shed, the balance of stabling demand was accommodated within the remaining sidings.

6.2 Horizontal Geometry and Turnout Strategy

To connect the depot sidings while maximising usable track length, NR56 full-depth BV8 turnouts with CEN56 rail were initially selected during early feasibility stages. These units were considered appropriate due to their compact geometry as identified in NR/L3/TRK/2049/Mod1, supporting procurement and maintenance considerations [**1**]. As layout development progressed, it became apparent that a back-to-back single-turnout arrangement would significantly constrain stabling capacity.

Following discussions with the installation contractor and with Stadler and Nexus, a revised turnout strategy was adopted incorporating type-three tandem turnouts and one single AV switch, which was incorporated at detailed design stage. The final layout comprised twenty-seven point ends, including three type-two tandems and twenty-three single turnouts. All turnouts were power-operated and controlled via the depot signalling system, with no manual points provided.

To further maximise space on parallel straights, and reflecting the low-speed depot operating environment, a minimum horizontal radius of 125 m was adopted, with zero cant throughout. Where virtual transitions were required, rates of cant-deficiency change remained well below typical limits. Although tighter curvature was accepted where necessary, radii were maximised wherever practicable. In locations where radii below 201 m were unavoidable, gauge widening was applied to mitigate rail wear and reduce the potential for increased noise, recognising the proximity of residential and commercial properties.

No lateral resistance plates were provided on curves below 201 m, consistent with NR/L2/TRK/2102 [**5**]. Their omission was considered proportionate given the low depot line speeds, lighter vehicle weights and use of jointed track, while also reducing maintenance and installation complexity.

The completed horizontal layout provided seventeen sidings serving a carriage wash, two light-maintenance roads (Sidings 10 and 11), two heavy-maintenance roads (Sidings 12 and 13), two stabling roads for Nexus maintenance wagons and one wheel lathe, meeting the project berthing requirements. The eastern approach arrangement is shown in **Figure 5**.

6.3 Vertical Alignment Strategy

The vertical alignment strategy differed from typical main-line practice. Rather than progressing from one end of the site, the design adopted a central datum with an extended flat grade aligned as closely as possible to existing track levels, thereby minimising cut and fill across the 12-acre site. Even modest vertical adjustments across the site would have required significant import of material, with consequences for cost, programme and construction traffic through surrounding residential areas and nearby schools.

At the western end, the retained wash slab imposed a controlling vertical constraint, as it was required to remain operational throughout construction to support the existing fleet. The existing reception-line gradient of approximately 1:65 could not be maintained through the western fan without introducing vertical curvature within turnout long bearers. To avoid this, a grade change was introduced between turnout units, flattening the gradient and relocating the vertical curve outside critical bearer zones. For the routes serving Sidings 5–9 and the MFB lines (Sidings 10–14), the steeper gradient was retained to maximise the extent of flat track through the main stabling areas.

6.4 Track Form and Componentry

As alignment development progressed, close coordination with other disciplines enabled iterative refinement to accommodate signalling equipment, walkways, lighting, depot protection systems and AVIS interfaces. Once these positions were agreed, the alignment was frozen and detailed track componentry was developed.

Switches and crossings throughout the depot utilised NR56 turnout units with CEN56 rail continued through the main stabling areas for consistency. In plain-line areas, G44 concrete sleepers were initially proposed; however, following embodied carbon assessment and procurement discussions with the installation contractor, these were replaced with F27 and F40 concrete sleepers. This change delivered embodied-carbon and cost benefits while also reducing training requirements associated with the fastening system, representing a value-engineering outcome within the project.

Track within the stabling areas was delivered predominantly as jointed track. Adoption of continuous welded rail was considered

Figure 5: Eastern approach showing, from right to left, Sidings 1 to 17 (Image courtesy of Stadler Rail).

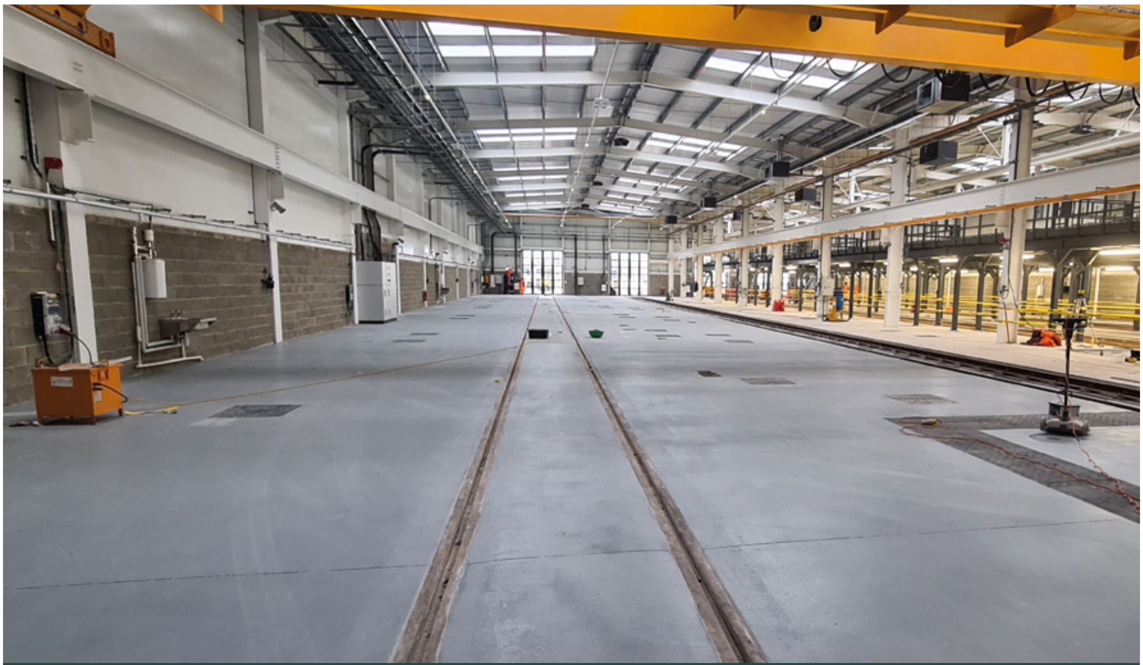

Figure 6: View looking west along Road 13.

thereby minimising the live electrical envelope. Contact-wire height was increased to a nominal 5.6 m throughout the depot to improve clearances for operatives at driver-access platforms and above walkways. All feeder and section isolators within the depot were replaced with LC Switchgear manual units to align with Nexus network practice. Where required, bespoke OLE supports were designed to integrate with new facilities, including a dangler support within the carriage-wash building and a wall-mounted cantilever on the MFB to provide temporary registration for Stabling Road 9 prior to demolition of the existing building.

disproportionate within the depot context, particularly given the low line speeds and geometric constraints. Use of CWR would have required increased minimum curvature (approximately 250 m rather than 125 m) and strengthened S&C units, increasing cost and lead times.

Within buildings, track support arrangements varied by function. Direct-fix track was adopted as the default solution and tailored to maintenance requirements. In the apron areas of the MFB and wheel lathe, rail was embedded within the concrete slab to allow vehicle and equipment movements. For the light-maintenance roads (Sidings 10 and 11), pedestal-supported track was provided, requiring transition to CEN60 rail to reduce deflection over the 1.5 m pedestal spacing.

On the heavy-maintenance roads, Siding 12 comprised a pit road with rail directly fixed to the cast pit walls, transitioning to embedded track through the MFB and storage areas to allow axle delivery by articulated vehicles. Siding 13 was embedded throughout (**Figure 6**), with both roads maintaining CEN56 rail continuity to the external ballasted track.

6.5 Overhead Line Electrification Design

The final OLE design was developed to support staged construction and commissioning. Works included the demolition and removal of more than 100 existing OLE structures across 20 roads, together with installation of over 100 new foundations and structures serving 17 new tracks. Nineteen new conductor runs were installed, totalling approximately 6.3 km.

Foundations for the new OLE structures comprised CHS tubular pile foundations, with earthed masts supporting double-insulated cantilevers. Standard UK Master Series 610 mm steel piles were used across the site, allocated using the ORE method in accordance with NR/L2/CIV/074 [**6**].

The Siemens SICAT LD OLE system was selected for compatibility with Nexus requirements for 1500 V d.c. operation and double insulation [**7**]. The system was used throughout the depot for most registrations, including aluminium and GRP cantilevers, multitrack cantilevers and headspans. Interfaces with existing single-insulated main-line structures were achieved in accordance with Nexus standards, with existing wiring modified where necessary and Furrer + Frey FL200 cantilevers installed on retained masts where headspans previously served both depot and running-line wiring.

Double-insulated OLE was provided on all new depot structures to mitigate stray-current risk, using insulated registration arms or contact-wire clips in addition to insulation within cantilever frames or cross-spans,

7. CONSTRUCTION STAGING AND IMPLEMENTATION

7.1 Staging Objectives and Constraints

As identified during the design development stage, completion of the final layout shifted the project focus to the integration of demolition and construction activities within a live operational depot environment. The staging strategy was required to maintain operational capacity throughout delivery, including provision of a minimum of 35 operational berths and continuous OLE electrification, while enabling progressive removal of the legacy depot and construction of the new facilities. Given programme duration and operational dependency, the primary staging objective was to release sufficient space to construct the new Main Facilities Building (MFB) at the earliest opportunity.

The previously agreed location of the MFB defined the extent to which existing depot infrastructure could be removed during early stages. While the existing berthing plan was retained wherever practicable, temporary berthing arrangements were accepted as necessary at individual stages. Throughout the works, a continuous internal through-route was maintained within the depot, together with the ability for trains to enter and exit the site at both the west and east ends.

7.2 Stage 1 – Initial Demolition and MFB Enabling Works

The Stage 1 demolition limits were established by overlaying the footprint of the new MFB onto the existing depot plan. Safe working zones of 10 m to the north wall and 20 m to the west wall of the new building were agreed with the installation contractor, defining the initial extent of demolition. This resulted in removal of the south-east corner of the existing shed. Working from south to north across the site was identified as the most effective sequencing approach, maintaining construction access while keeping the depot operational. Importantly, the existing signalling room located within the northern office area remained in service until completion of the new MFB.

Track removal during Stage 1 included complete removal of Roads 16–20 and partial removal of Roads 9–15 at the eastern end, together with the removal of twelve existing turnout units. Temporary weatherproofing was installed to exposed sections of the retained building to protect maintenance activities. Following clearance of track, structures and foundations within the Stage 1 area, construction commenced on the MFB foundations and superstructure, together with Stabling Roads 14–17, four new turnout units, and the wheel lathe foundations and structure. These new tracks were temporarily tied into the existing alignment to maintain stabling capacity through subsequent stages.

Figure 7: Bespoke temporary "biscuit" foundation used during staged construction.

Stage 1 also included removal of OLE structures and wiring over Roads 16–20 and partial removal over Roads 9–15 at the eastern end. Remaining wire runs for Roads 9–15 were terminated on bespoke temporary "biscuit" foundations designed to preserve the existing concrete floor and reduce construction complexity (**Figure 7**). These foundations were subsequently reused as temporary anchor arrangements in later stages. Four new roads were installed south of the retained building and west of the new MFB.

7.3 Stage 2 – Western Fan Reconstruction

With construction of the MFB and wheel lathe progressing, demolition activities shifted to the western end of the depot. Stage 2 comprised removal of the remaining sections of the existing building over Roads 12–15, together with associated foundations. Temporary weatherproofing was relocated to the new building edge. External tracks serving Roads 12–15, five turnout units and the existing fuelling road were removed from the western fan.

This stage included one of only two disruptive possessions undertaken during the project. During this possession, the existing equal-split tandem turnout was removed and replaced with the final tandem arrangement, together with new ballast and final connections to tracks installed during Stage 1. Additional works comprised installation of one turnout and partial installation of Roads 10–13 up to 20 m from the MFB face to provide safe working clearances. Due to proximity between the final Road 10 alignment and the retained temporary wall, Road 11 was installed in a temporary offset position, providing transit clearance while maintaining weatherproofing. This arrangement was adopted to increase staging capacity during the following demolition phase.

To maintain depot operations, OLE removal works during Stage 2 were split into four smaller sub-stages. This approach permitted installation of the new western tandem S&C unit within a single possession, while Roads 12–15 were progressively removed and re-electrified with new OLE equipment.

7.4 Stage 3 – Central Depot Reconstruction and Interface Management

Completion of Stage 2 enabled continuation of works at the western end during Stage 3. Civil works progressed on the MFB and UFC, while remaining legacy infrastructure was removed and new stabling tracks and OLE installed. This stage included demolition of the remaining building sections over Roads 9–11, removal of the associated plain line and three turnout units, followed by installation of three new turnout units and installation of Roads 9 and 10. Road 11 was slewed into its final position following removal of building foundations.

Road 9 represented the first installation of a final-state through road. However, to maintain construction access for subsequent phases, the track was not installed end-to-end. Instead, close coordination with the OLE team defined installation limits, with track constructed to the final isolation point required for operational power demands. A temporary OLE anchoring arrangement was developed to allow termination of the contact wire on the shortened alignment.

During Stage 3, interaction between retained depot infrastructure and new works became more critical. In particular, existing signalling location cases required for operation of the western fan on the northern side of the depot conflicted with the proposed turnout route towards the wash. To retain these assets in-situ, the turnout was temporarily omitted and replaced with plain line constructed to final horizontal and vertical alignment, allowing train movements to continue while maintaining clearances to signalling equipment (**Figure 8**).

7.5 Design Change and Eastern End Reconfiguration

The approved-in-principle (AiP) final design originally proposed a crossover at the eastern end to serve a single arrivals and departures road. The staging strategy incorporated this arrangement through multiple phases to minimise disruption to eastbound services. During Stage 3, however, Arcadis was instructed to revise the layout to provide separate arrival and departure lines.

The revised layout and vertical alignment were developed rapidly, with multiple staging options reviewed in consultation with the

Figure 8: Proximity of retained depot infrastructure during Stage 3 of construction.

Figure 9: View facing west on Road 8 during early Stage 5 of construction.

construction team and depot operator. While all options minimised disruption to eastbound services, several introduced unacceptable impacts to OLE, signalling and depot security, together with increased cost. A single extended possession was therefore adopted as the least disruptive and most cost-effective solution.

7.6 Stage 4 – Eastern Blockade and Operational Transition

Stage 4 was implemented as a 72-hour blockade comprising removal of three turnout units, the existing scissors crossover, short sections of plain line and associated OLE equipment. Following clearance, the revised arrival and departure tracks were installed, together with three new turnout units and final connections to Roads 9, 10 and 11. Completion of this stage established these roads as the first fully operational through routes within the new depot configuration.

This milestone marked a significant operational transition, with all depot activities relocated into the new MFB, including maintenance of the legacy fleet, depot signalling and associated functions, enabling planning for full decommissioning of the old depot during Stage 5.

Concurrent OLE works removed electrification over Roads 2–8 and the eastern shed, together with the existing arrivals/departures roads and diamond crossing. New OLE was installed over Roads 10 and 11, and Road 9 was extended to connect east and west ends north of the MFB.

7.7 Stage 5 – Decommissioning and Completion

Stage 5 represented the final phase of depot transformation. With operations fully transferred to the new facility, the remaining signalling room, office buildings, stores, paint shop, and stabling Roads 2–7 were demolished, together with the final sections of the old MFB structure. Track removal included seven turnout units and two crossovers (**Figure 9**).

Following the largest demolition phase, the final construction phase delivered the remaining depot infrastructure without reliance on existing assets. Works included installation of nine turnout units and one tandem, including replacement of the turnout omitted during Stage 3 due to signalling conflicts. Roads 1–8 were installed to complete the stabling layout, enabling construction of the final major civil structures, including the carriage wash and wash-plant buildings along the Road 1 access route.

OLE works during Stage 5 were split into three sub-stages to maintain depot operability. Remaining OLE assets over Roads 6–8 and the washer bypass were removed, followed by installation of new OLE over Roads 5–8 and subsequently Roads 1–9. New span-wire supports for the carriage wash were installed during this phase.

Final track installation enabled decommissioning of the existing wash facility and completion of the permanent way works. Following approximately four years from feasibility design to commissioning, the project delivered a fully operational modern maintenance depot, subsequently recognised at the 2024 Rail Business Awards for Infrastructure Project and Station Excellence.

8. CONCLUSIONS

The Gosforth Depot Remodelling project demonstrates that comprehensive renewal of a major rail maintenance facility can be delivered successfully within a constrained brownfield site while maintaining live operations throughout construction. The project required careful consideration of permanent way geometry, overhead line electrification, building interfaces and construction staging, all of which were intrinsically linked and could not be addressed in isolation.

A key outcome of the project was the early identification and management of fixed constraints, including retained gradients, legacy signalling interfaces, operational access routes and future network safeguarding requirements. Addressing these issues at feasibility and optioneering stages allowed design decisions to be tested against both operational and construction requirements, reducing risk as the project progressed into detailed design and implementation.

New trains, prepared for the next day (Image courtesy of Stadler Rail).

The integration of permanent and temporary works was central to maintaining depot functionality during delivery. Geometry decisions, track form selection and OLE sectioning were developed with staging explicitly in mind, enabling safe transitions between interim and final configurations. This approach avoided the need for extensive rework and supported the progressive transfer of operations into new infrastructure as it became available.

Close multidisciplinary coordination throughout design development proved essential. Alignment development was informed not only by permanent way and OLE requirements, but also by signalling, depot protection systems, maintenance processes, access arrangements and construction logistics. This collaborative approach ensured that the final layout was operationally efficient, maintainable and deliverable within the constraints of the site.

From an electrification perspective, adoption of a depot-specific double-insulated OLE system, combined with rationalised electrical sectioning and bespoke support arrangements, enhanced safety and operational flexibility while supporting staged commissioning. Permanent way solutions similarly balanced performance and maintainability, with component choices informed by geometric constraints, life-cycle considerations and constructibility within a live depot environment.

Overall, the project highlights the importance of treating depot remodelling as a system-level engineering challenge rather than a series of disconnected asset renewals. The approach adopted at Gosforth – from early feasibility through detailed design, staged construction and commissioning – provides transferable lessons for the delivery of similar depot renewal schemes, particularly where operational continuity, spatial constraints and complex interfaces must be managed concurrently.

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Industry Award Recognition

The Gosforth Depot project has been entered into numerous industry awards. It has been recognised as follows:

- Rail Business Awards - Infrastructure Project and Station Excellence: Winner
- Rail Business Awards - Supplier & Contractor Excellence: Shortlisted
- CIHT awards - Infrastructure award: Highly Commended
- Construction News Awards - Regeneration Project of the Year: Shortlisted
- Global Light Rail Awards – Vision of the Year: Shortlisted
- National Transport Awards: Shortlisted
- National Rail Awards – Infrastructure achievement of the year: Shortlisted.

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