

HS2 C2-C3 Enabling Works, Buckinghamshire to Warwickshire

The C2-C3 section of HS2 forms a critical part of the new high-speed rail route between London and the Midlands, extending from the Chilterns in Buckinghamshire through to Southam in Warwickshire. This strategically significant stretch of the programme includes a wide range of major structures and earthworks, delivered across predominantly rural environments and subject to complex geotechnical, environmental and logistical constraints.

Bauer Technologies Ltd in joint venture with Keller Ltd (BKJV) was appointed by Eiffage, Kier, Ferrovial Construction and BAM Nuttall (EKFB JV), working on behalf of HS2 Ltd, to deliver a comprehensive package of geotechnical solutions to facilitate the construction of this section of the route. The works demanded long-term planning, technical adaptability, and sustained collaboration across multiple delivery teams over several years of construction activity.

Scope of Works

BKJV's scope comprised a broad range of specialist geotechnical works delivered across approximately 100 individual assets and work locations along the C2-C3 alignment. The scope included:

- Bearing piles for new permanent structures including overbridges and viaducts, installed using rotary bored piling, both with and without support fluid, and CFA techniques. Pile diameters ranged from 750mm to 2400mm
- Piled earthworks, forming reinforced transitions adjacent to structures
- Piled retaining walls, supporting cuttings and structural interfaces
- Low permeability cut-off walls constructed to depths of up to 35 metres to manage groundwater regimes
- Drilled pressure relief drains, installed to assist with drainage control and settlement mitigation
- Ground pre-treatment, including low-pressure grouting for selected structures located within chalk geology

Although delivered under a single contract, the geographic spread and



Image: HS2 Ltd

asset-based nature of the works required the programme to be managed as a portfolio of interdependent sites rather than a single construction location.

Project Challenges and Solutions

The challenges encountered on the HS2 C2-C3 works evolved as the project progressed from early enabling stages through to near completion, reflecting both the scale of the programme and the changing site conditions over time.

A key challenge in the early phases was logistics and access, particularly within rural sections of the route where permanent site infrastructure had not yet been established. Many work locations required detailed pre-planning to facilitate the safe and efficient delivery of large piling rigs, cranes and ancillary plant, often via temporary access arrangements and constrained rural road networks.

The project also experienced periods of public opposition and protest activity, particularly within sensitive areas such as

the Chilterns. BKJV undertook its works considerably and collaboratively, working closely with EKFB to plan activities within defined constraints and minimise disruption, while maintaining programme momentum wherever possible. As the project matured and permanent infrastructure was introduced, these challenges eased and public acceptance increased.

From a programme perspective, resourcing at scale presented a significant challenge. The intensity of the works, combined with concurrent construction across other HS2 sections, placed sustained pressure on the availability of specialist plant, personnel and materials. This was addressed through early and ongoing engagement with the supply chain, detailed capacity assessments, and continuous communication to align resources with programme demands.

The asset-based nature of the scope introduced further complexity, with

frequent inter-dependencies and programme interfaces between EKFB sectional delivery teams. BKJV was one of the few subcontractors engaged across the full length of C2-C3, requiring careful coordination to manage shifting start dates, delayed design development and site readiness changes, while avoiding knock-on impacts across the wider programme.

A notable technical challenge arose with the addition of a low permeability cut-off wall at Wendover, introduced later in the contract to manage local hydrogeological conditions following excavation of a cutting. The wall was required to be highly impermeable while remaining low-strength, flexible and tolerant of post-excavation ground movements, properties that are typically in conflict.

Working closely with Bauer’s technical design team in Germany, and in collaboration with the Technical University of Munich, a bespoke mix design was developed and laboratory tested before deployment on site. The material was produced using automated batching and mixing units, with in-situ performance verified through on-site testing, exceeding the specified design criteria.

This element of the works was further complicated by overhead high-voltage power lines, which restricted headroom across approximately 25 per cent of the site. To overcome this, Bauer sourced a specialist low-

headroom hydraulic grab, drawing on its machinery manufacturing expertise, enabling safe and accurate construction of the cut-off wall within the imposed constraints.

Sustainability and Innovation

The HS2 C2-C3 works provided opportunities for BKJV to contribute to a range of sustainability initiatives, aligned with EKFB’s wider environmental and social objectives. These included supporting community-based sustainability activities, such as tree-planting events and ecology protection and enhancement days, helping to deliver local environmental benefits alongside construction activities.

Bauer also implemented PPE recycling initiatives, transforming waste materials into usable products while supporting employment opportunities for individuals re-entering the workforce.

From a technical perspective, BKJV delivered internally led process improvements to piling within chalk geology, significantly reducing the volumes of bentonite drilling fluids sent to waste and improving material efficiency across the works.

Health, Safety and Collaboration

Delivering works of this duration and complexity required a sustained focus on health, safety and collaboration. Close working relationships were maintained with EKFB’s sectional delivery teams throughout the length of the route,

enabling consistent standards, shared learning and effective management of programme change.

Ongoing coordination, transparent communication and a collective problem-solving approach were central to managing the evolving programme, maintaining safe operations across multiple live sites, and ensuring that quality and compliance were upheld throughout.

Conclusion

The HS2 C2-C3 works demonstrate Bauer Technologies’ capability to collaborate with an industry partner to deliver large-scale, technically complex geotechnical solutions across a geographically dispersed and logistically challenging programme.

Through early planning, technical innovation, supply-chain engagement and close collaboration with Keller, EKFB and HS2 Ltd, Bauer successfully supported the delivery of one of the most significant infrastructure projects in the UK. The works underline Bauer’s expertise in managing complex ground conditions, evolving programme demands and sustainability considerations, while maintaining high standards of safety and engineering excellence over an extended construction period.

<p>Contractor: Eiffage, Kier, Ferrovia Construction, BAM Nuttall (EKFB JV)</p> <p>Client: HS2 Ltd</p> <p>Contract Period: Preliminary test piling: from July 2020 Main construction works: April 2021 to December 2025 possessions</p>	<p>Scope of Works: Bearing piles, piled earthworks, retaining walls, cut-off walls, drainage works and ground pre-treatment</p>	<p>Equipment Used:</p> <ul style="list-style-type: none"> • Bauer BG45 (5 no.) • Bauer MC76 with DHG/C hydraulic grab (1 no.) • Bauer GB50 low-headroom with DHG/LT hydraulic grab (1 no.) • Soilmec SR65 (1 no.), SR95 (2 no.), SR125 (2 no.) • Liebherr HS8100 with Negrini hydraulic grab (1 no.) • Various Klemm, Hütte and Casagrande drilling rigs (12 no.) • CAT 395 long-reach excavator
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