

Belfast Harbour D3 Berth Development



The Belfast Harbour D3 Berth Development forms part of a major investment programme to enhance the capacity, resilience and future operational capability of one of the UK's busiest commercial ports. The project will create a new quay wall and associated marine infrastructure, supporting Belfast Harbour's continued growth as a key gateway for travel and tourism, freight, logistics and international trade. BAUER Technologies played a critical role in delivering an innovative engineering solution that enabled the project to progress while maintaining the original design intent and significantly improving constructability.

Working on behalf of GRAHAM for Belfast Harbour, BAUER Technologies was appointed to provide specialist relief drilling to support the installation of 118 driven tubular piles forming the new combi-wall quay structure. While the scope was straightforward in principle, the project evolved into a technical engineering challenge requiring innovation, collaboration

and specialist geotechnical expertise. Drawing on its extensive experience in complex foundation engineering, BAUER Technologies developed a bespoke installation methodology that not only resolved the project's principal construction challenge but also delivered significant sustainability, programme and commercial benefits for the wider project team.

Scope of Works

BAUER Technologies' principal role was to support GRAHAM during the installation of 118 driven tubular steel piles that form the permanent combi-wall structure for the new D3 berth quay wall. The tubular piles, ranged from 32.75 to over 40 metres in length and measured 1,829mm in diameter, and required specialist relief drilling to enable them to be installed safely and accurately to their required design depths.

BAUER's scope also includes specialist relief drilling to assist with the installation of 24 dolphin piles that are programmed for Q1 2027. These works will take place

from a jack-up barge, extending BAUER Technologies' specialist marine piling expertise.

Throughout the project, BAUER worked in close partnership with GRAHAM, ensuring that engineering decisions, sequencing and construction methodologies remained fully aligned with the overall programme while maintaining the highest standards of safety and quality.

Project Challenges and Solutions

The project's greatest challenge emerged before the main piling works commenced.

An in-situ test pile undertaken during November 2025 demonstrated that the originally proposed installation methodology was unlikely to achieve consistent results. The initial approach assumed that the tubular piles could be driven to refusal before BAUER completed relief drilling through and below the installed tubular piles to ease the remaining driving required to achieve design toe. In practice, deformation of the steel tubular piles

during back-driving (after relief drilling) prevented this methodology from consistently achieving the required design depths, creating programme and engineering challenges.

At the request of GRAHAM, BAUER Technologies undertook a comprehensive engineering review of the relief drilling process. Working closely with colleagues across BAUER Spezialtiefbau's design and development teams, the business developed a bespoke under-reaming solution specifically for the Belfast Harbour project.

The resulting on-top reaming tool enabled relief drilling to be undertaken at a slightly greater diameter than the tubular pile itself, effectively creating

an under-reamed section beneath the installed pile. This innovative approach significantly reduced installation resistance during the subsequent back-driving process, providing a reliable and repeatable construction methodology capable of delivering the required pile performance.

Although the concept had previously been trialled on a limited number of international projects, Belfast Harbour represented the first time the modified system had been successfully adapted to the site's unique geological conditions. The project therefore became an important demonstration of BAUER Technologies' ability to combine global engineering knowledge with

local project expertise to solve complex construction challenges.

Additional technical challenges were presented by the presence of igneous intrusions, including basaltic dykes, encountered across sections of the site. These formations had the potential to prevent both pile driving and reaming operations.

The chosen design solution required the construction of reinforced rock sockets incorporating dense reinforcement cages and universal beam sections. BAUER Technologies undertook detailed three-dimensional modelling and comprehensive space-proofing exercises to optimise the construction methodology, enabling these highly congested structural elements to be installed safely, accurately and efficiently while maintaining concrete quality and constructability.

Sustainability and Innovation

Innovation lay at the heart of the Belfast Harbour project. Rather than requiring the redesign of the quay wall to adopt alternate methodologies or products, BAUER Technologies' bespoke under-reaming system enabled the project team to retain the original combi-wall design and continue using pre-ordered tubular steel piles.

This delivered substantial sustainability benefits by eliminating unnecessary material waste, avoiding the manufacture of replacement structural elements and preventing the significant embodied carbon associated with a revised cast in situ alternative. At the same time, the solution reduced programme risk, protected the client's investment in materials and avoided the delays typically associated with major design revisions.

The project also demonstrated the value of investing in engineering innovation. Rather than relying solely on established construction techniques, BAUER Technologies drew upon the wider technical expertise available across the BAUER Group to develop a bespoke solution specifically tailored to the project's requirements.



The result was a methodology that improved constructability while simultaneously delivering commercial, environmental and programme benefits for all project stakeholders.

Health, Safety and Collaboration

Successful delivery of the Belfast Harbour D3 Berth Development piling works relied upon close collaboration between BAUER Technologies, GRAHAM, Belfast Harbour and the wider project team.

From the earliest stages of the project, BAUER worked collaboratively to assess the risks identified during the test piling phase and develop an alternative installation methodology that could be implemented without compromising safety, quality or programme certainty.

The engineering development of the bespoke reaming tool required close coordination between operational teams, specialist designers and equipment development engineers, ensuring that the final solution was both technically robust and practical to deliver on site.

This collaborative approach extended throughout construction, with detailed planning, engineering reviews and continuous communication enabling the project team to respond effectively to changing ground conditions while maintaining safe working practices across all phases of the works.

Conclusion

The Belfast Harbour D3 Berth Development demonstrates BAUER



Technologies' ability to deliver far more than specialist piling works. Faced with an installation methodology that proved unsuitable under site conditions, BAUER applied engineering expertise, innovation and collaborative problem-solving to develop a bespoke solution that enabled the project to proceed successfully.

By combining specialist geotechnical knowledge with practical construction experience, BAUER Technologies

helped preserve the original project design, reduce environmental impact, improve constructability and provide lasting value for the client and principal contractor alike.

The project stands as an excellent example of how engineering innovation, underpinned by collaboration and technical excellence, can overcome complex construction challenges while supporting more sustainable infrastructure delivery.

Main Contractor:

GRAHAM

Client:

Belfast Harbour

Contract Period:

March – July 2026 - April 2027

Project Duration:

April 2025 – September 2027

Scope of Works:

- Relief drilling to support installation of 118 tubular piles forming the D3 Berth combi-wall.
- Development and deployment of a bespoke under-reaming tool.
- Support for installation of 24 dolphin piles during the later marine works phase.
- Engineering support for rock socket construction through basaltic intrusions.

Equipment Used:

- 2 x BAUER BG45 rigs
- On-top reamer
- Reaming auger
- Centralising tool
- 1680mm drill tools
- 1500mm drill tools
- 1350mm drill tools
- Modified tremie systems