Barhale

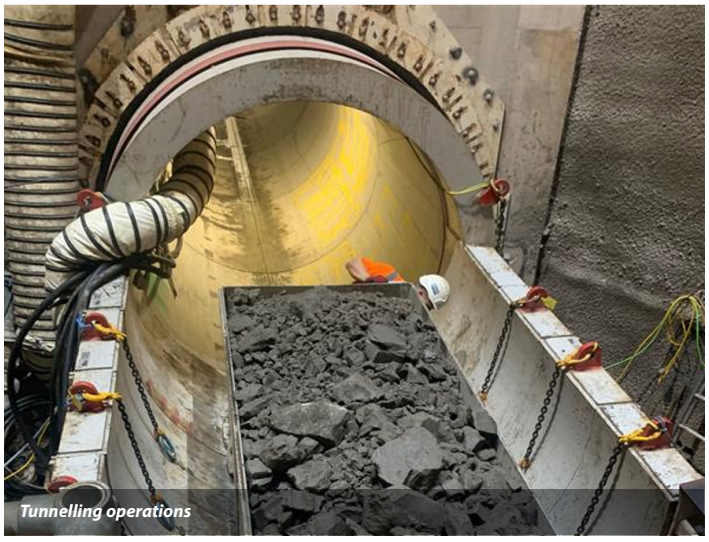
Barn Elms Combined Sewer Overflow Connection Tunnel

Client:	Thames Tideway West / BAM Nuttall, Morgan Sindall and Balfour Beatty
Location:	London
Value:	£12.7m
Duration:	2 Years

In Brief...

As part of works on the west section of the Thames Tideway Tunnel scheme, Barhale were contracted by the BAM Nuttall Morgan Sindall Balfour Beatty (BMB) joint venture to construct a series of complex underground structures that would intercept the sewage overflows from the West Putney Storm Relief Sewer for transfer to the main Tideway tunnel beneath the River Thames.

Hydraulic structure wall pour


Tunnelling operations

Technical Features...

The scope of works included the construction of a 35m deep x 6m internal diameter drop shaft and a 210m long x 3m outside diameter connection tunnel. Surface level works include 6m deep reinforced concrete (RC) interception chambers, a RC culvert and a RC MEICA building, comprising of electrical intake room, telemetry room and control room for system alarms and automated actuated valves (installed by others). Barhale also built an 800m long, 4m wide access road, and installed additional sections to address Environment Agency and Local Authority requirements related to existing flood defences and protected trees in the proximity of the works.

The shaft construction required initial and primary spray concrete lining (SCL), with a secondary cast-in-place concrete lining to encase a new 26m long x 90mm dia. stainless steel vortex drop tube pipe. The shaft was constructed using steel fibre reinforced concrete, applied by an Aruga robotic spray machine as the excavation progressed in 1.2m increments.

The tunnel was constructed using an open-face shield tunnel excavation machine with a built-in back actor excavator and muck conveyor, and the pipe jack method. Pipes were jacked continuously as the excavation of the tunnel face progressed. This will be followed by a cast-in-place secondary liner to the pipe jack tunnel. The tunnel excavation machine, which needed to be compatible with 3m dia jacking pipes, would not be recoverable from the reception shaft. To address this challenge, Barhale collaborated closely with its suppliers to design and construct a tunnel excavation machine (TEM) whose internal parts could be dismantled, removed and re-used after the project's completion.

Barhale also worked with suppliers to design and procure an automated tunnel liner system that significantly improved the tunnel secondary liner programme. This consisted of a specialist automated tunnel formwork system that would ensure the tunnel secondary lining was constructed efficiently by pouring each section in one pass. This will also improve quality by reducing the number of construction joints compared to more traditional methods. As the equipment is fully automated, the hydraulic stop ends ensure a robust seal when pumping concrete. A mechanical travel system enables quick set-up for the next pour with minimal resources, and it removes the need to manually strike and reconstruct formwork for each section of the lining.

The client required 120-year design life for the pre-cast concrete jacking pipes. To achieve this, Barhale's engineers worked closely with the client's designer, materials engineers and pre-cast experts to develop a detailed quality assurance system that included concrete mix trials and quality audits at our supplier's facility. In addition, we implemented a stringent quality control regime that covered the pre- and post-pouring of the pipes, curing, handling and transportation of the pipes.

Carrying out the works required excellent stakeholder management throughout. Heavy plant deliveries are required to fall within stringent Tideway traffic management plans. Thorough planning and consultation with the supply chain, client representatives and 3rd party stakeholders were also key for excellent HSE performance. Barhale supported BMB with meetings and workshops with asset protection teams, Thames Water, the Environmental Agency, the local authority and local council groups.