

# Victoria Embankment Combined Sewer Outlet - Tideway Central

**Client:** Ferrovial Construction Laing O'Rourke JV (FLO)

**Location:** Victoria Embankment, London

**Value:** £16m

**Duration:** 3 Years, 8 Months

## In Brief...

As part of the works on the Tideway project, Barhale was awarded a contract by the Ferrovial Construction Laing O'Rourke JV (FLO) on the central section to construct the tunnelling and civils elements between the existing Combined Sewer Outlet (CSO), located under the Victoria Embankment river wall and the new main tunnel being constructed under the River Thames. Barhale successfully undertook the piling, dewatering, shaft sinking (by using three methods), tunnel construction, earthworks and RC structures.



Shaft excavation



River wall demolition and service subway works

## Technical Features...

### Piling

Barhale constructed a secant pile wall behind the Victoria Embankment river wall with the support of Expanded, one of our specialist supply chain partners. The logistics involved working in a narrow footprint access road, leaving a gap of 300mm between the piling rig and the site hoarding. After completion of the secant pile wall, 2 gas mains (30" and 36" medium and low pressure) were diverted behind the wall. Inside the cofferdam, Barhale lifted a 50T piling rig to construct 70 no 1200mm contiguous piles for the new river wall, and 42 600mm piles for the new CSO foundation.

### CSO Drop Shaft and Connection Tunnel

The 15m dia x 48m deep shaft and the 3m dia x 18m long connection tunnel were excavated through river terrace deposits, alluviums and primarily in London Clay. The final 10m were in the Lambeth Group (a set of geological rock strata that comprises a complex of vertically and laterally varying gravels, sands, silts and clays). A 3m thick layer of granular material was found in the crown of the tunnel. The layer had pressurised water. To allow excavation, the team relied on a comprehensive scheme of dewatering and toolbox items. The shaft was supported using a mix of precast shaft segments (35m) and SCL lining (17m). Comprehensive measures to reduce ground movement to a minimum were also implemented throughout.

The ground conditions encountered during the excavation of the connection tunnel were some of the most challenging experienced throughout the whole project, and they required utilisation of multiple geotechnical and construction techniques such as dewatering, complemented by pipe arch, spiles and banker bars. These were used to excavate the 17m of tunnel to the back of the main tunnel segments.

The shaft secondary lining with thickness ranging between 650mm and 1400mm, was completed using a bespoke shutter which had the facility of self-propelling from the shaft base slab to the final ground level. Barhale will then build the shaft internal structures, including surrounding of a 2.5m vortex pipe, baffle wall and divide wall.

At the CSO, a steel flume was installed to strengthen the low level sewer and protect it from the impact of ground movement. The existing sewer had to be kept live during the works due to its critical importance to the area. To address this, all the works were undertaken during low tide and night shifts, when the water level would drop significantly to a level where works could take place.

With the flume installed to support the LLS1, Barhale undertook the demolition works required to accommodate the new permanent works into the existing river wall, service subway, and low level sewer. This included the removal of the heritage stone cladding from the existing river wall.



## Technical Features Cont...

### External structures

Barhale will construct the new river wall, interception chamber (including reinforced concrete for connection to low level sewer and around services subway), valve chamber, connection culvert, overflow chamber, air treatment chamber, backfill, slabs, cover slabs and upstands.

The new river wall and the top slab of the structures will provide the city of London with a new public realm space over the newly constructed CSO structure.

