



British Precast Drainage Association

Publications from the British Precast Drainage Association (BPDA):

BPDA was formed in 2017 from the integration of the Concrete Pipeline Systems Association (CPSA) and the Box Culvert Association (BCA).

Information published by both CPSA and BCA will be rebranded and replaced as BPDA in due course. New material will be branded BPDA.

All CPSA and BCA web traffic will be redirected to the new BPDA web site at www.precastdrainage.co.uk



FPMcCann precast concrete pipes and tunnel segments are key to alleviate flooding in North West London

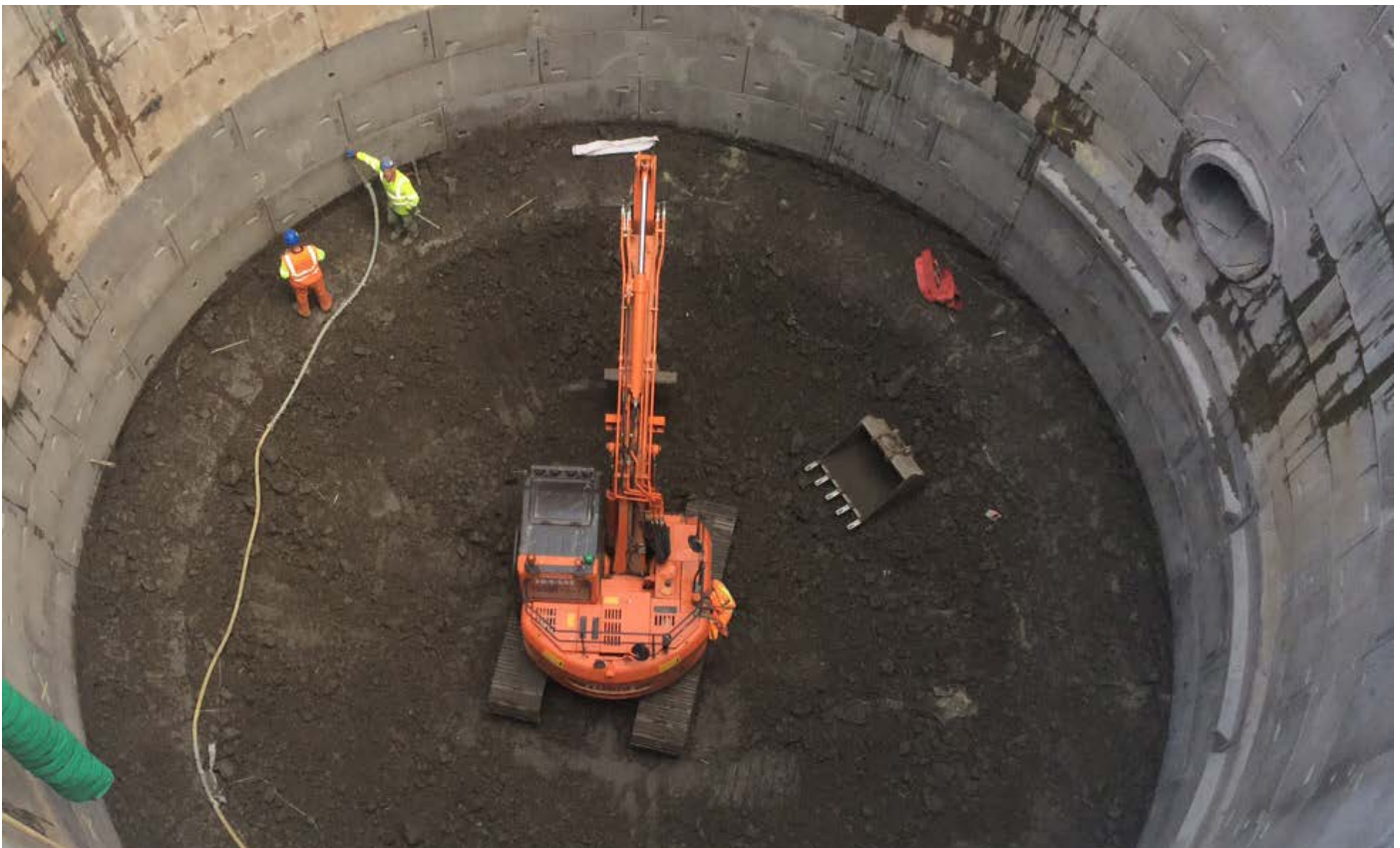
Precast concrete pipes and tunnel segments are the key to an innovative scheme to alleviate flooding in North West London says Stuart Crisp, Business Development Director of the Concrete Pipeline Systems Association

The Chamberlayne Road flood alleviation scheme will prevent 36 homes, businesses, a school and a church in Willesden suffering flooding as a result of severe rainstorms overwhelming the existing combined sewer network. The £6.4m Thames Water initiative involved construction of a giant 15m diameter, 28m deep underground storage tank in Tiverton Green Park. The retained water is then pumped from the tank once sewer flows have returned to normal.

Along with construction of the giant cistern, the works also involved construction of a new 1200mm diameter, 420m long sewer tunnel to transfer flows from Chamberlayne Road to the new tank, and a new 1200mm diameter 130m long sewer tunnel to connect the tank to the existing sewer network. The use of 1200mm diameter pipes provided 800m³ of additional water storage. The wider sewer network was also upgraded to ensure the additional flows can be transferred to the storage tank before homes are flooded.

It was originally proposed to install the sewers using open-cut construction. This would have been disruptive to residents because it would have involved excavating the entire route. Instead joint venture contractor Barhale Optimise proposed a pipe-jacking solution using precast concrete pipes. This minimised disruption to local roads and residents, it reduced the need to dig around buried services and unexploded World War II ordinance and it helped shorten the project's duration.

Pipe jacking uses hydraulic jacks to push sections of precast concrete drainage pipe into a small tunnel created by a tunnel boring machine (TBM). The TBM travels horizontally from a vertical launching shaft to a reception shaft, which can be up to several hundreds of metres away, from where it is retrieved.



The works commenced with Barhale excavating the shaft to accommodate the 1700m³ storage tank. The shaft was constructed in two phases. First it was excavated to a depth of 17m and a temporary base created from which to launch the two of the tunnel drives. Once the drives were completed the temporary base was removed and the shaft excavated to its final 28m depth.

Precast concrete smoothbore segmental rings, manufactured by FP McCann, were selected as the most cost effective method of supporting the shaft walls. "Precast concrete is the most commonly used product for this type of work because installation tends to be much cheaper than using alternatives such as Shotcrete," says Mark McGeady, Barhale's project manager.

The depth of the shaft meant that two types of precast segments were used. The top 23 rings were constructed from fibre reinforced precast concrete segments, while high ground pressure meant the bottom five segmental rings had to be constructed from segments incorporating a purpose-designed steel reinforcing cage. All segments were manufactured by FP McCann and incorporated a factory fitted EDPM gasket to provide a watertight seal to the shaft.

Barhale used two closed face TBMs to drive the new sewer tunnels through the London Clay. First the new 130m tunnel to connect the new storage tank with the existing sewer. The TBM for this was launched from within the 15m diameter shaft. It is pushed horizontally into the ground by two hydraulic rams; the TBM's rotating head excavates the earth, which is then pumped to the surface as slurry. Once the rams are fully extended, the slurry pipes and cables are disconnected from the TBM to allow the first 1200mm diameter precast concrete jacking pipe to be lowered into the rig.

With the precast concrete jacking pipe in place the TBM's pipes and cables are re-attached and the process is repeated. This time, however, the rams press against the precast concrete pipe to push it slowly into the newly formed tunnel behind the TBM. The process continued with the addition of precast concrete pipe sections until the TBM appeared in as temporary shaft, excavated at the point where the tunnel meets the existing sewer, from where the TBM was retrieved. "Steel pipes could have been used, but they would have been much more expensive," says McGeady.

The longer second tunnel linking the new storage tank to Chamberlayne Road was constructed from 1200mm diameter precast concrete pipes in two separate drives to keep tunnel distances within the TBM's capability and jacking pressures within safe limits. A final 70m section of this tunnel along Chamberlayne Road was constructed from 600mm diameter precast concrete pipes.

All the precast concrete jacking pipes were manufactured by FP McCann using a wet cast process to ensure a smooth external finish to minimise frictional resistance during the tunnel drive. The pipes have a minimum structural strength of 50N/mm². "FP McCann has provided an outstanding service to deliver the job on time and have also assisted with some of the complex structural designs within the shafts," says McGeady.

