VAN ELLE
TOTAL FOUNDATION SOLUTIONS

CASE STUDY
Alcester Flood Alleviation Scheme

Project: The piling to resist water table uplift in the bottom of an attenuation tank.
Location: Alcester, Warwickshire
Client: Severn Trent Water
Principal Contractor: Morgan Sindall
Project Engineer: Grontmij
Design & Build Partner: Active Tunnelling
Geotechnical Contractor: Van Elle
Overall Project Value: £2.7m
Project Completion: April 2012

Project Overview:
Flooding is a growing threat to towns across the UK and the past few years have seen many a miserable householder return to their property as media crews look on. The environment agency has actually predicted that spending on flood alleviation will double by 2035 to £1 billion. Even this figure, however, is put into perspective by the £3.2 billion estimate of costs caused by just the floods of 2007, of which £2 billion was attributed to household damage.

All well and good in terms of future spend and protection, but the Warwickshire town of Alcester needed more immediate attention after the town had suffered from heavy rain and storm water overflow, exposing the old sewersystem as unable to cope with significant downpours.

"It's a flood alleviation scheme to resolve numerous foul flooding issues in and around Alcester," says Van Elle's Group Business Development Director, Mark Williams.

"Previously when the rains came, the sewerage would breach the manhole covers and flood the high street. This means that nearby properties are on the flood risk register, leaving them uninsurable until the sewer capacity could be increased."

With these storm events clearly providing the lack of capacity in the existing system, client Severn Trent Water turned to Morgan Sindall and its design and build partner, Active Tunnelling, to come up with a solution to store potential overflows until drier weather returns, at which point it could be pumped back into the system and then treated.

Storage Solution:
This has led to the construction of a large attenuation tank that can store up to 3,250cu m of storm water, along with a 500m system of various diameter sewer pipes ranging from 225 to 750mm.

The project got under way in early September with shaft sinking in the English Heritage land adjacent to the Stratford Road for the sewer pipes. Disruption to local residents and businesses was largely confined to work on the open cut sewer pipes in the Stratford Road and all were more than happy to be exposed to minimal inconveniences for the huge benefits it was going to bring this small town. This part of the work completed in mid February, allowing the closed portion of the road at the junction with the High Street to be re-opened.

Active Tunnelling sunk the new attenuation tank using a Caisson technique to press it into the ground, excavating the material using mini excavators between each jacking phase.

This process sees the whole ring jacked down against reactionary steel piles at surface level, after which the excavators get to work again.

Almost counter-intuitively, the excavators, while removing each 1m of soild from within the central core area, also work directly underneath the bottom of the current position of the vertical wall of the tank. But while this might seem unnecessary to the uninitiated – after all, there is a large mass of concrete with 20m or more of shaft bearing down – skin friction prevents the wall from slipping unexpectedly under its own weight.

The tank itself is formed from segmental rings that are bolted onto the shaft after the caisson is jacked down for each of the 1m pushes. Construction depth for the shaft to the formation level of the 15m diameter concrete base is 23m. The base benches to form a sump so that the sewerage flows to two submersible pumps, each of which can provide redundancy should the other fail , and these will pump the storm water 30 m to an existing pumping station.

Flotation Risk:

However, one major cause for concern was the possibility that the installed tank wouldn't stay in place and would end up floating on the water table, so Van Elle was called in to provide the means for prevention. "If they put a normal concrete slab base in without piles, there is the worry that it would lift," explains piling foreman, Lee Hamilton.

Something was needed to keep everything in place. "We installed anti-flotation tension piles to resist water table uplift, which are comprised of concrete with a steel Dywidag bar," says Mr. Williams.

"The piles go in 10m and we installed them using the Soilmec Puntel hammer rig which was craned into position."

Including the test piles, 60 have been built, with these connected to the reinforcement within the 1m thick concrete base.

Mr Hamilton says the job has come in well within the originally envisaged four-week timeframe, partly due to the efficiency with which the Puntel rig went through the ground. "Van Elle's 12 day job started on the 6th February with a 400mm piling mat that goes staright onto the mudstone," he says.

"But what we're piling through is small bands of gypsum. Augering through it would be hard, but the rig's hammer action turns it to dust."

The 200mm diameter piles have a 40mm Dywidag bar, and these also work by skin friction after the Puntel has hammered through to create a socket.

Completing the attenuation tank is a cover slab of steel reinforced concrete, while final works completed earlier this month included access road construction and soft landscaping. This latter takes the form of a screening hedge, obscuring the scheme from the public eye. Once it's taken root, it should leave the town of Alcester with a sewerage overflow solution that is out of sight and out of mind.