Botany Bay Road Sewer Improvement Scheme

Replacement sewer reduces potential flooding risk in city suburb

Southern Water implemented the 20-week project to avert the potential threat of untreated sewage flooding in a Southampton suburb after a critical sewer collapsed due to the weight of an illegal waste tip. The importance of the replacement work to avoid pollution incidents was critical due to its location adjacent to the Sholing Common stream, which provides areas of riparian habitat. The site is also designated as a Site of Importance for Nature Conservation, which is known as the Shorburs Greenway SINC. Carried out by one of Southern Water's major capital delivery partners, Barhale Trant Utilities (BTU), the work involved installing a new sewer line to replace two existing pipelines, including the damaged one, in sensitive and challenging conditions.

The illegal tip that caused one of the existing sewers to collapse - Courtesy of Southern Water

Undertakings

The replacement 300 metre sewer, with a 600mm dia, was installed using a combination of open cut pipework and a slurry microtunneling system. The selection of the microtunneling method was based on the construction difficulties to install the new sewer along the 200m section below the popular public footpath in the middle of the linear wooded valley, which is steep sided and bordered by residential streets higher up on either side in the Botany Bay area of Sholing.

A 200-metre section of Shoreburs Greenway, the footpath, was closed for the duration of the works. Temporary traffic lights for restricted periods were utilised on the adjacent South East Road to allow necessary delivery and off loading of plant and equipment for the scheme.

Ecological conditions

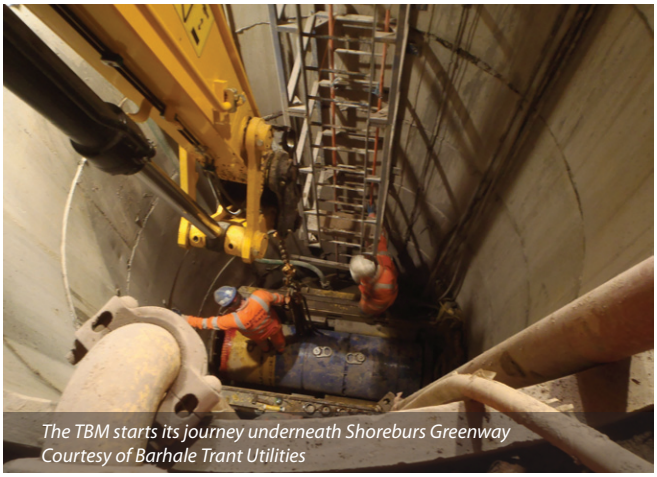
One of the challenges was the heavily wooded, narrow and sloping topography, the sensitivity of the ecological conditions meant a constricted working environment due to local authority restricting the working easement to a seven-metre width.

A number of trees had to be removed to ensure the safe manoeuvring of heavy plant machinery; they were later replaced with a planting series of trees of a mature size, along with saplings, and in keeping with indigenous species such as hazel, hawthorn, dogwood and bramble.

An ecological assessment had been carried out beforehand, but habitat disturbance was unavoidable. However, the reinstatement plan was developed in conjunction with Southampton City

Machinery associated with tunnelling operation
Courtesy of Southern Water


The TBM is lowered into the shaft
Courtesy of Barhale Trant Utilities


The TBM starts its journey underneath Shoreburs Greenway
Courtesy of Barhale Trant Utilities


Successful completion of Drive 1. Machine head emerging from the entry gland seal, designed to stop groundwater and ground from being lost into the shaft during recovery - Courtesy of Southern Water

Council's Open Spaces team and Council Ecologist, with the aim of making long-term improvements to the area.

Existing ground conditions in the stream vicinity, including peat layers of up to 1.5m thickness, provided technical and construction challenges. Additional depth of excavation was required to ensure manholes were founded on the underlying gravel formation.

At the Botany Bay site, the ground conditions at tunnel level are predominately sands and gravels, which are ideally suited for the choice of utilising slurry microtunneling. An additional benefit of this form of trenchless technology is that it requires a relatively small area in which to set up the equipment, therefore limiting the required space on site, and so minimising disturbance to the environment and local community.

Microtunneling

2 (No.) 7.5 deep 2.4m dia reception shafts along with 1(No.) 8.5m deep 3.0m dia drive shaft were sunk using caisson rings. Two successful drives were undertaken from the central drive shaft to install the 200m length of new sewer pipe below the adjacent highway and main wooded area.

Control of the alignment of the microtunnel, and therefore the new sewer pipe that is being installed behind the machine, is achieved with a pipe laser set up at the rear of the jacking station directly on the centreline of the drive and at the axis point of the machine.

This laser shines onto a target that is set dead centre within the rear of the TBM and the TBM Operator views this via a camera within the TBM which repeats onto a TV screen within the operation cabin on surface.

The position of the laser on the target provides a physical readout of the position of the machine relative to the design line and a steering indicator on the same target indicates which way the TBM is being steered to maintain the alignment against design.

Whilst the specified tolerances for installing sewers by microtunneling are generally +/- 50mm line and level, at Botany Bay both drives were successful achieved within a tolerance of +/- 10mm.

Savings

Slurry separation equipment designed to work in harmony with the TBM allowed the slurry to be recycled indefinitely. This completely removed the need to dispose of liquid waste. The ability to recycle slurry indefinitely significantly reduced the environmental impact of BTU's tunneling operation. Estimates for the 600mm drive resulted in saving 12 tonnes per day (or 15,000 litres of waste) from being sent to landfill by tanker. Additionally, there was no need to import water or refill from the mains, meaning savings of 15,000 litres of water per disposal.

Site traffic, and therefore fuel use, was reduced along with reductions in dust and noise. The savings of approximately 2.5 hours of production time per shift when measured against similar drives prior to adoption of this system resulted in a reduction of the duration of the contract and the overall impact of site activities on the local environment.

Changeover sequence

The final construction sequence required close cooperation working with Southern Water operations, to overpump and divert the existing flows into the new 600 dia sewer. A successful changeover sequence resulted in the new sewer asset becoming operational 2 weeks ahead of programme.

Customer awareness

An essential element of the scheme was the customer interface

before and during the works, as part of Southern Water's drive to improve its service to customers through a capital delivery awareness initiative entitled improving customer experience.

More than 500 initial awareness letters were sent out to local residents and businesses before work commenced in November 2011, with local schools and colleges also informed. Furthermore, a drop-in information session was held, along with door-to-door calls. Written updates, posted through letterboxes, were also provided to ensure everyone was kept abreast of the situation.

Such was the success of the information campaign that a number of residents expressed their thanks in letters. The 'good neighbour' policy was especially important because the project was a sensitive one and very much in the public eye, with the controversial circumstances surrounding the sewer collapse making front page news in the regional daily newspaper.

In the wake of the information campaign, Richard Price, Head of Capital Delivery at Southern Water, said: *"We received a great deal of support from the local community, and we were grateful for their patience and cooperation throughout the construction work."*

Conclusion

Local schoolchildren planted flowers and trees to mark the official end of the major engineering project, completed ahead of schedule.

The new sewer is now able to work to full capacity, substantially reducing the risk of flooding or further network damage, whilst affected woodland and footpath area have benefitted with an increased planting and enhanced footpath reinstatement.

The Editor & Publishers thank Southern Water and Barhale Trant Utilities for preparing the above article for publication.

Major construction work was carried out close to homes and in the garden of one property - Courtesy of Southern Water

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