

# Tottiford Trunk Main System

## £5.9m replacement & refurbishment of major supply route

by  
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**T**ottiford system conveys treated water from Tottiford Water Treatment Works to the Torbay Area and is linked to the neighbouring supply zones, Littlehampston and Venford, which provides operational flexibility and security of supply. The trunk main system consists of four unlinked cast iron mains – 19inch, 15inch and two 10 inch mains. The 18inch and 15inch mains date back to the 19th century, one 10inch was laid in the early 1900s while the other was laid in 1950. The mains are unable to withstand the full operating pressure of the system; principally the lead joints being pushed out. Hence, Tottiford is not able to deliver its full output of treated water and a greater reliance is placed on supplies from Littlehampston and Venford.



courtesy: South West Water



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Route of the existing four mains ran almost parallel to each other from Tottiford WTW to the town of Newton Abbot, approximately 12km. At this point the route of the mains diverge and adopt individual routes to service reservoirs within the Torbay area. The route of the mains include sections through Dartmoor National Park, follow 'red-routes' through Newton Abbot to Torquay and has special engineering difficulties such as rail crossings, bridge structures and rock. An evaluation of options was carried out by *South West Water*, assisted by Contractors *Subterra* (now a division of *Enterprise*) and *T J Brent*. The job split logically into two sections, the top part where the mains ran parallel to each other and the lower part as the mains diverged.

Top section of the mains where they ran parallel out of the works was largely in Dartmoor National Park. On the surface it would seem to be a straight forward decision to replace the four mains with one. However, since the mains had been laid the area had become copsed and heavily wooded and any new pipe track in the area would be unacceptable environmentally. Rehabilitation of the pipes would be equally unacceptable since making access for the equipment would be just as damaging.

#### Decision

In the end it was decided to lay a single 600mm Ductile Iron main. Selecting a new route out of the wooded area was not without its difficulties. The main was to flow by gravity which discounted much of the easier 'High level' route through open agricultural land. Therefore, careful route selection was required to maintain a siphon system. Working closely with the National Park, a route was chosen to avoid the natural habitat of deer, bats, dormice, badgers and rare plants.

There were other challenges during construction. Dartmoor has an abundance of granite out crops, so blasting and pneumatic breaking was required throughout the moorland section. As the moor was left behind the route entered an area famous for its mining of ball clay, so particular care had to be taken to replace land drains and provide new drainage since a new pipeline can have a severe affect on natural drainage in a clay soil structure.

#### After the mains diverged they were dealt with separately.

Analysis of the system showed that the **two 10inch mains** could be abandoned. Five cross connections were made and a **1km long 300mm Ductile Iron link main was laid**. This made a significant saving to the scheme in avoiding working on the main road into Torbay, a notorious 'red route'. Options for rehabilitating the 15inch are currently being considered but epoxy spray lining is the likely solution.

#### Subline technique

For the 10 km of 18inch main from Newton Abbot to Gallows Gate service reservoir the *Subline Technique* was the chosen option to refurbish the pipe. This semi structural application was used since, while the existing pipe was structurally sound, leakage was occurring due to the pulling of lead joints. *Subline* uses a standard grade thin wall PE liner which was designed to form a tight fit with the host pipe to maximise capacity and combat corrosion, water quality and leakage problems.

#### Procedure for installing is:

A detailed investigation of records and pipeline route established the location of the various pits required to carry out the process and replace the existing apparatus. These were determined by the existing layout, access arrangements for plant and equipment, and the positioning of suitable work areas to weld and prepare the liner. The host pipe was cleaned using scrapers and plungers before being CCTV inspected to confirm that the internal surface was smooth for the liner.

Liner pipe was delivered to site in 12m lengths to be welded into long pipe strings that were then passed through the *Subline Machine*. The *Subline* process reduces the cross sectional area to approximately 60% of the original, which greatly facilitates insertion and winching of the formal liner through the existing host pipe. This, together with the fact that the *Subline* shape is produced by pushing the liner pipe through the process and strapping it to maintain this shape, meant that lengths up to 700m could be installed in a single pull. It also enabled the host pipe to be utilised as a conduit to manoeuvre the liner along the main to reach its final position, thus avoiding extensive site activities in areas where access was a problem. The liner is then reformed by pressurisation with water. Individual lengths are joined, replacing the required fittings and connections using standard components.

The new and rehabilitated mains had to be tested and commissioned whilst still maintaining water supplies to customers and the high summer holiday maker influx. This operation was further hampered by the dry summer and autumn, which resulted in low reservoir levels at Tottiford and deferring the project completion until early in 2004. All open-cut pipelines were completed using a Design and Construct contract with *T J Brent Ltd*. *Subline* rehabilitation of the 18inch trunk main was Designed & Constructed by *Subterra*.

**Total project cost was £5.9m. ■**

**Note:** *Andy Dawe is Project Manager, South West Water; Ben Whyman, T J Brent Project Manager; Nigel Wardle, Subterra Project Manager.*