

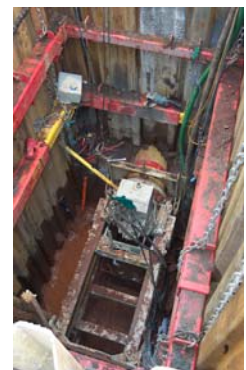
## Malvern Sewerage Flood Relief Scheme

|                        |                    |
|------------------------|--------------------|
| <b>Client</b>          | Severn Trent Water |
| <b>Designer</b>        | Haswell            |
| <b>Value</b>           | £2.4m              |
| <b>Completion Date</b> | May 2005           |

This sewerage flood alleviation project was delivered to solve foul water flooding to a number of properties and to close a combined sewer overflow to reduce watercourse pollution. The scheme was constructed in 6 locations in both urban and rural parts of Malvern, including land owned by the Malvern Conservators, and a key element of the 'customer care' process and public consultation was a well attended pre-contract public exhibition.

The main elements of work included

- A 325m<sup>3</sup> shaft tank pumped storage system at Upper Howsell Road constructed in highway verge with an 11m deep x 9m dia smooth bore segmental shaft
- As part of the CSO abandonment at Sherrards Green a 400m<sup>3</sup> storage tank to balance flows and protect the downstream system from flooding was constructed at shallow depth using a dual line of 1.2 m high x 1.8m wide pre-cast culvert units. Demolition and replacement of the CSO was particularly sensitive as it was situated in the garden of a widowed pensioner. The culvert storage tank also had to be constructed through part of a former landfill which required over-digging and replacement of material below the culvert to improve the formation as well as disposal of all excavated material to non-hazardous landfill.
- A total of 1350m of foul sewer constructed in open cut with pipe sizes ranging from 1200mm – 375mm dia and depths up to 7m. Extensive traffic management was required for this work the majority of which was in highway and highway verge
- 165m of 450mm dia guided auger bore at the upstream end of the Madresfield Rd interceptor sewer that saved time, cost, and disruption that relocation of a gas governor and associated mains would have entailed to allow open cut construction.



## Malvern Sewerage Flood Relief Scheme (contd)

- The catchment transfer to Hall Green Pumping Station required installation of 1185m of interceptor sewer up to 825mm dia along Madresfield Road and across farmland together with a 2625m<sup>3</sup> on line storage tank, at depths of up to 9m, in the farmland just upstream of the existing pumping station.
- We considered a number of alternative designs for the tank construction during the tender process and offered to construct an in-situ reinforced concrete tank 210m long x 6.4m wide x 2.1m high which resulted in a significant saving to the client over the designed scheme of pre-cast concrete culverts. The farmland location allowed a battered excavation for the tank although its alignment was adjusted to avoid several ancient oak trees.



- As a significant element of the work was in a rural location environmental issues were given a high priority which included saving ancient trees, careful removal of hedgerows, avoiding mature trees and protected verges (Malvern Conservators) and providing environmental improvements to local schools and ponds.



- The project was successfully delivered on time and to budget, overcoming a number of technical challenges whilst cooperating closely with the many stakeholders involved.