Bath CSO Project

£28.5m scheme to solve uCSO problems in sensitive area

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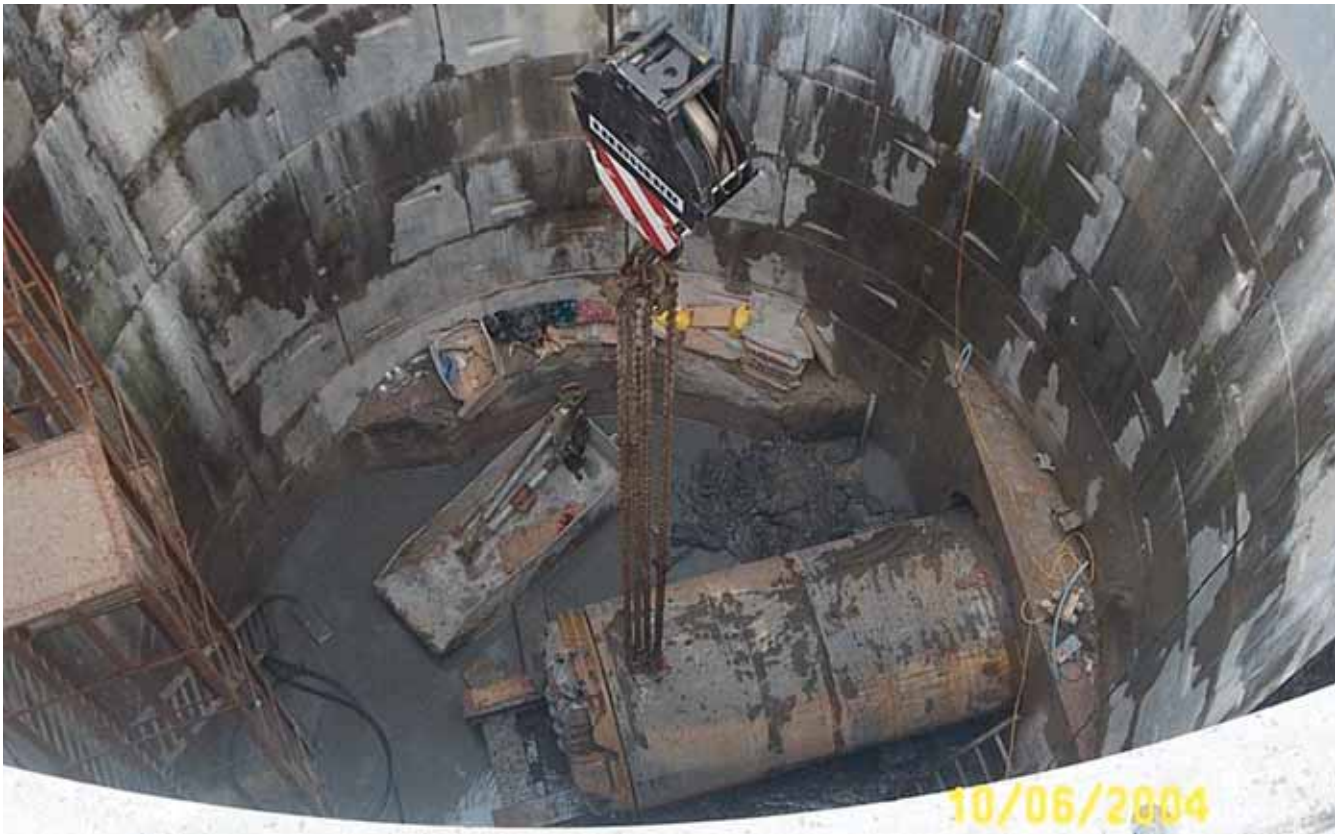
The River Avon flows through the City of Bath, a location with a rich cultural heritage surrounded by green belt countryside forming the Cotswold Area of Outstanding Natural Beauty (AONB). The city is a UNESCO designated World Heritage site. By the start of the 20th century the combined sewerage system, which had grown with the population, was discharging raw sewage to the river. Between 1910 and 1914, the city council implemented a scheme to serve a population of 80,000 people for the removal of crude sewage discharges from the river. This £255,000 scheme saw the construction of riverside intercepting sewers with simple high level overflows, and a terminal pumping station that transferred flows to a new treatment works located 8km outside of Bath in the village of Saltford. There are in excess of 100 combined sewer overflows (CSOs) discharging to the river in the Bath sewerage catchment.



Bath CSO Project: Emergence of 1.2m dia micro tunnel after 245m drive in central Bath *courtesy: Wessex Water*

At the start of AMP2, the Environment Agency (EA) had designated 27 CSOs in Bath as unsatisfactory (uCSOs). A number of projects were implemented that addressed 18 uCSOs by the end of the AMP2 period. The Bath CSO project was initiated at the start of AMP3 to address the remaining 9 uCSOs and to improve the spill performance of the remaining CSOs with a regulatory completion date of 31 March 2005.

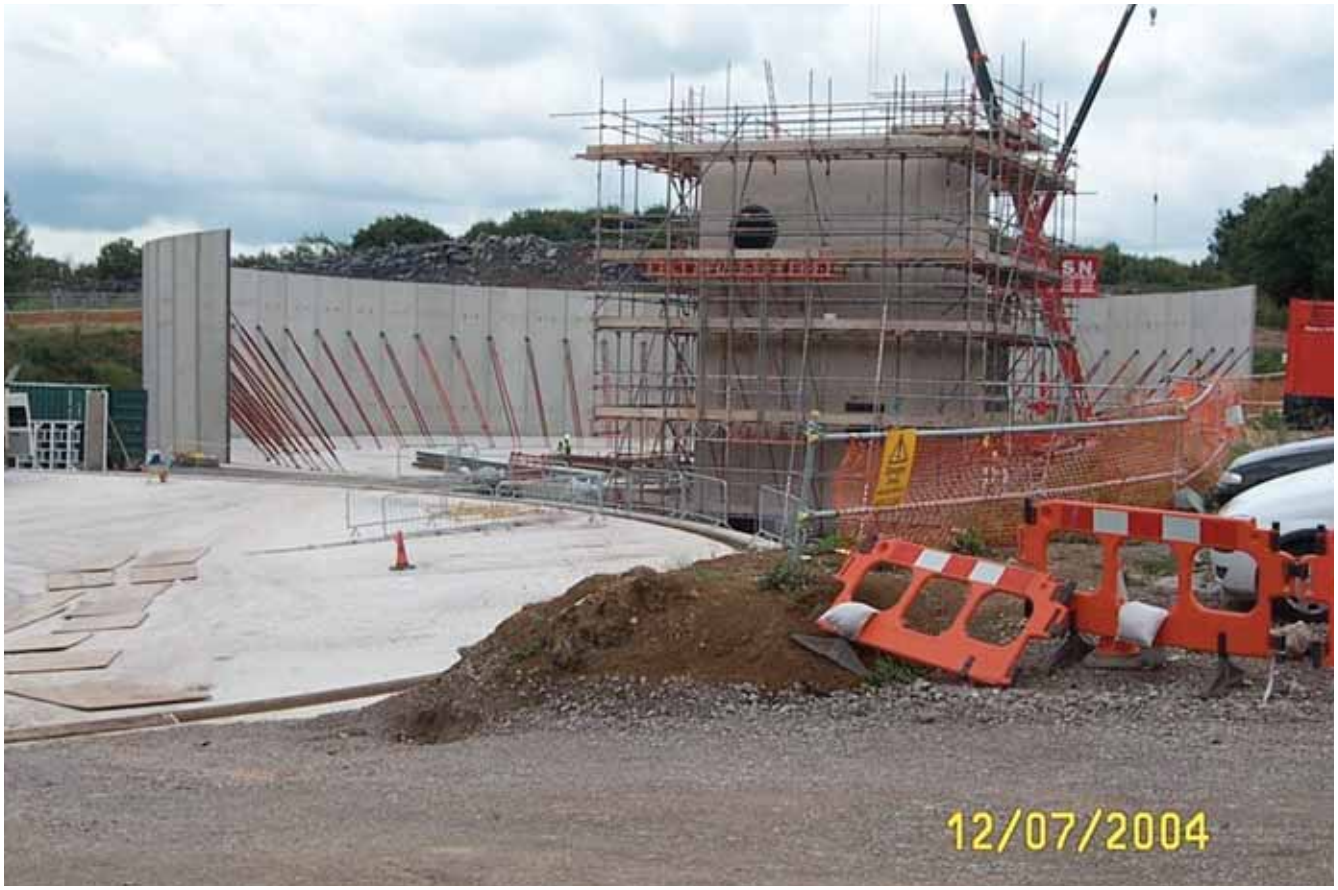
Project Brief

In August 2000, Wessex Water issued a feasibility study specification to three consortia of contractors and consultants. The brief required the consortia to assess and present proposals based on either:

* providing a large diameter storage tunnel;
* new terminal pumping station and pumped main to Saltford sewage treatment works;
* provision of localised storm attenuation tanks including refurbishment of the existing terminal pumping station;
* an alternative of their choice.

The performance specification attached to the feasibility study required:

* the 9 uCSOs discharge no greater than 15,000m^3 of storm sewage in total, and each operate no greater than 3 times per year;
* spills from other CSOs within the Bath network spill no greater than 70,000 m^3 of storm sewage per year in total;
* all performance to be based on the design outputs of a modified *Hydroworks* sewer model of the existing network. The model of the existing system having been audited and subsequently agreed with the EA;



Construction of 45m diameter storage tanks at Saltford STW *courtesy: Wessex Water*

* the current population equivalent for the design to be 120,000 with an additional allowance for population growth over a 50 year design horizon.

In addition to the proposals addressing engineering, commercial and programme specifications, there was a requirement for the consortia to provide detail on their proposals to manage the specialist geological, hydrogeological, environmental and cultural factors implicit with carrying out major works in Bath.

Design & Planning
A quantitative assessment of the feasibility bids led, in the summer of 2001, to the appointment of *Costain Ltd* as Wessex Water's preferred contractor.

Further work was undertaken by *Costain* to develop their feasibility proposal and to produce an initial target cost for the design and construction of the scheme. In April 2002, Wessex Water approved the progress of a £28.5 million scheme based on a modified feasibility proposal consisting of:

* three separate underground storm attenuation shafts varying in size between 7.5m and 15m diameter, and up to 19 metre deep. Flow returns, driven by variable speed pumps, vary between 10 and 100 l/s depending on the site and available capacity in the receiving sewer. Each site includes the facility for chemical dosing to minimise the onset of septicity. One site next to residential properties, will have odour scrubbers installed as a secondary odour control mechanism;

* A new 10.5m diameter, 17m deep underground terminal pumping station at the existing pumping station site. Two submersible variable speed pumps, operating on an alternating duty/standby basis will operate against both the existing pumping main (30" dia.) and a newly constructed pumping main. The combined operation of the two pumping mains and the two sets of duty/standby pumps give a maximum pass-forward rate of 1050 l/s, doubling the pass-forward of the existing pumping station which will be decommissioned;

* a new pumping main comprising of 7.6km of 700mm internal diameter pipe laid through heavily urbanised areas of Bath and the rural environments on the fringe of the Cotswold AONB. This new pipeline comprises mainly of ductile iron pipe constructed in open cut with the exception of a 380m length of 800mm OD MDPE installed by a directionally drilled crossing of the River Avon at Saltford;

* 350m of 1.2 metre microtunnel in blue lias limestone geology beneath the River Avon and prime re-development land in Bath. This included a single drive of 245 metres using an innovative 1.2m diameter TBM with rear access to the cutting face;

* two partially buried 45 metre diameter, 8 metre deep precast concrete storm tanks at Saltford sewage treatment works. These tanks receive flows from a new 6mm mechanically screened CSO situated upstream of the treatment process and provide 26,000m^3 of storm storage.

Return flows are pumped back to the treatment works inlet when storm flows have abated.

Sensitivity
Due to the sensitivity of working in a World Heritage setting, Wessex Water agreed to submit the project for consideration under the Town & Country Planning Act 1990. Due to the nature of the work there was a requirement that an Environmental Impact Assessment be carried out targeting the following impact areas:

* rivers and watercourses;
* hydrogeology, geology and contaminated land;
* recreation, visual amenity & cultural heritage;
* ecology and nature conservation;
* agriculture and soils;
* traffic impact;
* odour;
* noise and air quality.

The resulting Environmental Statement and Planning Application was submitted to the local authority in November 2002 and subsequently approved in January 2003.

Procurement & Programme

Following planning approval, *Costain Ltd* prepared and submitted a target cost to complete the detail design, construction and commissioning of the agreed project scope based on an amended ECC Option C form of contract. the contract included the agreed definition of specific risk activities allocated to either the contractor or client. Where agreed risk activities were allocated to the contractor, these were contractually excluded from becoming the subject of a future compensation event.

In May 2003, a target cost for delivery of the works was agreed and construction started in June 2003. During construction planning it was agreed that the Wessex Water project manager, cost manager and construction engineers would be embedded with the *Costain* construction team on site. This strategy has seen development of an open working relationship between the two parties where proposed changes or issues are addressed jointly at an early stage to minimise cost and programme impacts.

As the new works had close interaction with the existing sewerage network, an 11 phase commissioning plan was developed and commissioning phase started in November 2004. This culminated in the successful transition from construction to full operational status of all sites during March 2005. ■

Note on the authors: *Phil Brown is Client Manager & Drummond Modley, Engineering Manager both with Wessex Water.*