

# Barrow New Treated Water Reservoir becomes part of Bristol Water Northern support scheme

by  
**Michael Smith**

**B**ristol Water initiated the Northern Strategic Support Scheme (NSSS) as a means of providing an additional supply of water to 200,000 customers in north Bristol in the event of an emergency. Various options were considered to achieve this aim and the NSSS included in the AMP4 Business Plan submission. The principle behind the scheme is that water will be pumped from a new pumping station at an existing treatment works situated to the south of Bristol, along a new pipeline around the south and east of the city, via second stage pumping to an existing service reservoir to the northeast of Bristol. The aim of the design was to construct a solution capable of providing 75% of the average demand of north Bristol, at very short notice and under emergency conditions.



Barrow Reservoir: Northern Strategic Support Scheme under construction

*courtesy Bristol Water Plc*

The scheme has been divided into four projects:

- \* 13.5km of reinforcement trunk main around Bristol;
- \* a 40MI treated water reservoir and pumping station to the south of Bristol;
- \* a new second stage pumping station;
- \* renovation of 10.5km of existing trunk main.

This report concentrates on the 40MI treated water reservoir and pumping station situated to the south of Bristol.

## Background

An existing treatment works to the south of Bristol will treat the required water. In the event of this scheme being called upon under emergency conditions, a reservoir is required to provide a buffer whilst the treatment process adjusts to the rapid increase in demand. In addition, we know that from previous experience a vigorous PR

campaign will reduce demand by 25% over about 3-4 days. Accordingly, the reservoir has been designed to accommodate this, 50MI identified as the preferred size. A pumping station is required to pump this water along a duplicated trunk main to north Bristol.

The reservoir provides an additional operational benefit in that the existing treatment works has very limited treated water storage on site. Its construction will provide much needed storage to assist with the routine supply of water to one of our major cities.

## Location of the reservoir

:Locations for the reservoir were limited by hydraulic constraints. To avoid costly second stage pumping on the treatment works the top water level (twl) of the reservoir had to be below the twl of the treatment works contact tank. Similarly, to avoid the need to pump into existing supply the bottom water level (bwl) had to be above the level of the existing gravity outlet mains that feed south Bristol.

These constraints were translated into ground levels and a contour map produced showing the potential reservoir locations in the vicinity of the treatment works. From this 4 potential sites were identified. When choosing the preferred location consideration was given to the length of pipework required between the reservoir and existing mains, access, security, off-site disposal and land purchase. The preferred site overcame all these potential concerns by utilising land already owned by the company in which existing mains were already laid, being adjacent to the existing treatment works providing good access and improved security; being likely to secure planning consent and adjacent to a landowner potentially prepared to sell us the additional land required.

**One disadvantage**

The one significant disadvantage with this location was that the reservoir was to be sited at the foot of an earth embankment forming part of a raw water storage reservoir. This embankment, although currently stable, had suffered from movement and slippage in the past. There was concern that excavation of a deep hole so close to it would generate another slip.

A thorough ground investigation exercise was commissioned and followed up by a detailed geotechnical stability analysis by *Halcrow Group Ltd*. The outcome identified that the risk of slippage would be reduced to the level that currently exists if the reservoir was moved to be at least 60m away from the embankment. By this time negotiations for land purchase had become complicated, such that we could not purchase enough additional land to accommodate the preferred 50ML option sited far enough away from the embankment. Accordingly the size was reduced to 40MI to allow us to meet the 60m criteria, thus avoiding the need for an expensive secant piled wall to retain the embankment, To support the geotechnical analysis a comprehensive monitoring regime has been implemented, utilising

inclinometer tubes and boreholes at four locations, which to date has recorded no movement of the embankment.

**Detailed design & specification**

The site is constrained in that it has the raw water reservoir embankment on one side, ancient woodland on two other sides and a series of trunk mains running along the fourth side of the roughly rectangular plot of land. To aid construction the pumping station was contained within the rectangular plan shape of the reservoir.

Preliminary design was carried out by *Bristol Water*, who continued with the project management of the scheme. The £10m project is being constructed by *Costain Ltd* as part of the BWAMP4 framework arrangement, with *Black & Veatch* undertaking the outline and detailed design.

The 40MI reservoir is 150m by 75m in plan and 5m deep, split into two 20MI compartments and at this size will be Bristol Water's second largest service reservoir. The reservoir has been designed for continuous construction with propped cantilever walls, a flat slab roof and circular columns spaced 5m apart,

To comply with planning requirements the roof will be covered with topsoil and grassed over and a substantial planting scheme implemented to eventually join together two existing areas of ancient woodland.

The integral pumping station will house 5 pumpsets in a duty/duty/duty/duty/standby configuration to deliver a peak flow of 101MI/day at 85m lift and an average duty of 76MI/day at 70m lift.

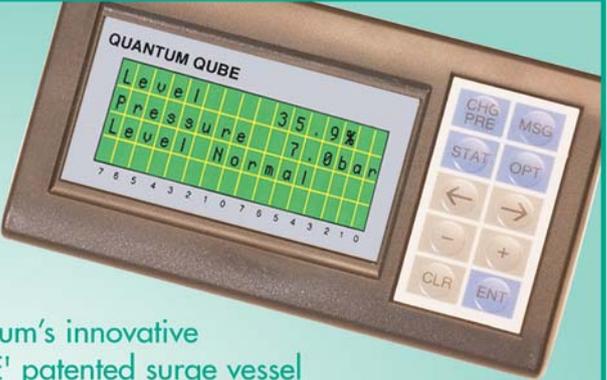
The reservoir will have a 1200mm diameter inlet main and gravity connection to the 30", 27", and 20" gravity trunk mains that supply

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Northern Strategic Support Scheme - reservoir under construction showing column casting rig

courtesy Bristol Water Plc

the southern part of Bristol. The pumping station delivers water into two 600mm diameter trunk mains to supply water to the north of the city.

#### Construction

Work commenced in November 2006 and faced with a tight time scale, fast track construction techniques are being employed. These include appropriate concrete design to allow speedy striking of wall shutters, temperature matched curing of test cubes and use of an innovative steel column shutter rig that allows casting of 6 columns at a time.

The project is currently (end of June) 50% complete, on target to be commissioned on time and is currently within the £10million available budget. Its timely completion means that the whole NSSS is set to be delivered within the £25 million budget by the 31st March 2008 deadline. ■

**Note:** *The Editor & Publishers wish to thank the author, Michael Smith, Civil Engineering Manager with Bristol Water Plc, for providing the above article for publication*

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