

Plymouth Shellfish Waters – Improvements

£14m investment meets Shellfish & Bathing Waters Regulations

by
Plymouth Area K3 Project Team

The city of Plymouth, on the south coast of Devon, is situated at the confluence of the River Tamar, bordering Cornwall, which contains shellfish waters, and the River Plym, an area widely used for recreation. At the point of confluence, the rivers discharge into Plymouth Sound, a tidal body of water which includes designated Bathing Waters. Since 1990 South West Water has made significant investment in this area, including the construction of a new treatment works to serve the southern half of the City and major upgrades to the four works serving the rest of Plymouth (PE 316,000).



8,000m³ tank under construction at Plymouth STW. (Copyright: Still Imaging, Chudleigh, Devon; courtesy SW Water.)

National Environment Programme

The main driver for this work under AMP3 is the National Environment Programme, (NEP), which identified 19 Combined Sewer Overflows (CSOs) within Plymouth and 15 CSOs within Saltash to be upgraded in accordance with the Shellfish Waters Regulations. The regulations require the average significant spill frequency to be limited to less than ten spills a year for CSOs in each agglomeration.

In addition to the Shellfish Waters scheme additional storage was required at Plymouth Central Treatment Works to improve compliance with the Bathing Water Directive.

Strategies

A number of strategies were evaluated for the improvement of the CSOs. The main options considered were:-

- * construction of storage tanks and tank sewers to increase storage;
- * sealing off CSOs;
- * passing more flow forward at a number of locations to restrict the number of attenuation tanks required;
- * installation of 6mm screens.



3000m³ tank under construction at Warton Mill
(Copyright: Still Imaging, Chudleigh, Devon; courtesy SW Water.)

Hydraulic modelling

For each catchment extensive hydraulic modelling studies were carried out to determine the storage volumes required for each site. In some cases this highlighted that modification of the sewerage system could avoid the need for storage.

Design

The final scheme consisted of five new storm tanks in the Saltash areas, with a total storage volume of 2,026m³, five new storm tanks in the Ernesettle and Camels Head area, with a total volume of 7,290m³, and a single new storm tank at Plymouth Central Treatment Works with a volume of 8,000m³. In addition new screens were installed in 19 existing CSOs for flows up to 935l/s. The remaining CSOs either required minimal work or were candidates for removal from the NEP list.

The schemes were developed by *Hyder Consulting, Pell Frischmann, Alfred McAlpine* and *Biwater* as part of their Programme Partnering with South West Water. Cost of the schemes was £14 million and Target Costs were audited by *Chandler KBS*.

Design for the new storage tanks was site specific. Each of the tanks was evaluated and value engineered to give the optimum solution in terms of capital and operational costs, maintenance and speed of construction. Factors that affected the design at each site included:

- * Environmental impact on the surrounding area;
- * Public Relations;
- * Land availability;
- * Hydraulic profile of the sewer system;
- * Cleaning and emptying of the tanks;
- * Programme constraints;
- * Planning requirements;
- * Temporary works;
- * Utilisation of existing assets.

Construction

Detailed design and construction began in March 2002 for the Saltash scheme with operational use achieved in December 2002.

The Ernesettle, Camels Head and Plymouth CSO schemes commenced in July 2002 with operational use achieved in March 2003. To meet these tight construction programmes every attempt was made to simplify construction and utilise prefabricated units. Working as an Area Programme Team gave the opportunity to move resources across various sites within the area. Below is a list of the major storage tanks and the construction method used:-

* **Jubilee Green, Saltash.** A 500m³ tank constructed using driven sheet piles. This method was chosen due to the short time available as the site was required for Golden Jubilee celebrations in June followed by water skiing events until September.

* **Riverview, Saltash.** A 450m³ reinforced cast in situ concrete box built alongside an existing pumping station. This was designed to utilise a gravity fill and empty system to minimise the operational costs.

* **Homer Park, Saltash.** An 850m³ tank constructed with 3m diameter HDPE pipe. The design was chosen as it offered the least environmental impact in an area designated for public open space and nature conservation.

* **Wolseley Road and Carlton Terrace, Camels Head.** Tanks of 1075m³ and 1175m³ respectively. Limited land availability meant that the chosen options for these tanks were 15m diameter segmental shafts, built using top down techniques. To speed construction the roofs were formed from pre-cast beams and slabs.

* **Weston Mill, Camels Head.** A very flat hydraulic profile, along with the need to keep access covers off a public football pitch, meant that a design of 3m and 2.6m diameter HDPE pipes was chosen for this 3,000m³ storage tank.

* **North Prospect, Camels Head.** This CSO required 2,000m³ of storage within an already congested STW. The solution was to use two underground sludge digesters that were being decommissioned. Directional drills connected these to a new 9m diameter pumping station which provided the final storage required. This solution was chosen to make best use of existing assets.

* **Plymouth Central CSO.** A requirement for 8,000m³ of storage was met by the construction of an above ground pre-cast, post tensioned, circular tank with a geodesic aluminium dome roof. A very tight construction programme and known contaminated ground made this the preferred solution.

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As part of the consent requirements, 6mm equivalent screens and telemetry monitoring of spills were installed at all CSOs. Pass forward flow control was achieved using Hydrosides, Hydrobrakes or orifice plates. Pumps were installed where necessary to return flows to the sewer. Tank cleaning and odour control was installed to ensure that there would be no future maintenance problems or public complaints.

Summary

The use of Partnering allowed this programme of works to be delivered to a very tight timescale. All of the partners worked as a single team to overcome any difficulties and to allow successful completion. ■

Note: The above article was written by the Plymouth Area K3 Project team: *Tim Hunt, Project Leader with South West Water Ltd; Helen Bali, Design Manager with Hyder Consulting Ltd; Alastair Hegarty, Project Manager with Alfred McAlpine Construction Ltd; Martin Littlemore, Project Manager with Biwater Treatment Ltd.*