Cumwhinton WTW
upgrading of treatment works serving Carlisle area

by
Quentin Rea

Cumwhinton WTW, operated by United Utilities, supplies water to Carlisle and the surrounding area. In order to meet the company's latest guidelines for reducing the risk of Cryptosporidium breakthrough, the sludge treatment processes of the plant had to be upgraded. Whilst carrying out this work, the opportunity arose to upgrade plant capacity from 23 Mld to 27Mld and to improve inlet facilities on the River Eden from 23 Mld to 32 Mld.

Cumwhinton: WTW under construction courtesy HMB Alliance

The new works comprises the installation of new wedge wire screens in the River Eden. The new pumping station with its basement sunk 8m into the river bank, anchored into sandstone bedrock, must be able to withstand floods of up to 1m above the level of surrounding ground. Installed pumps will raise the water 60m to the upgraded treatment works. A further set of pumps will give the option of pumping 5Mld against a head of 120m to Castle Carrock impounding reservoir.

Valving at the pumping station will also be provided to enable gravity flow from Castle Carrock to Cumwhinton when required. Surge protection is provided at the pumping station to alleviate surge pressures arising from rapid pipeline shutdown.

Despite the significant engineering content of the pumping station, the use of traditional materials on the exterior will ensure that it blends pleasantly into its surroundings.

At the treatment works new lamella clarifiers and rapid gravity filters were constructed. Flow will then pass through the existing chlorine contact tank and be pumped into a recently constructed new service reservoir. The lamella clarifiers consist of three streams, each with three stage flocculation. sulphuric acid, aluminium sulphate and polyelectrolyte will be dosed within the inlet pipework which incorporates static mixers at the dosing lances. Static mixers represent a significant cost and energy saving when compared with traditional flash mixers and should provide improved floc formation.

Six new rapid gravity filters are being constructed. Each filter has a 50m^2 surface area consisting of 800mm of sand overlain with 400mm anthracite. The filters will operate at a maximum rate of 6m/h. The proprietary system selected for the filter floor is designed to ensure excellent distribution during air scour and backwash.

Chemical storage, make-up and dosing equipment is housed in a new building which also contains air scour blowers. backwash pumps and all motor control centres. The new substation supplying power to the works will be housed in a separate building.

A major element of the new works is the upgraded washwater and sludge handling plant. This includes a lamella system for clarifying

Cumwhinton: WTW under construction courtesy HMB Alliance

the filter washwater before it is returned to the head of the works and new sludge thickeners for sludge produced by the process and washwater lamellas.

The entire new works is constructed within the perimeter of a redundant service reservoir, demolition of which was the first activity on site. However, two of the reservoir walls are to remain to provide screening of the new plant. They will be strengthened with additional concrete to the outside face of the wall and the embankments reconstructed to incorporate a modern drainage system.

To stabilise the combined structure, earth fill will be placed behind a low gabion wall on the inside face surrounding the new washwater recovery plant.

Design work

Outline design of the works was completed by United Utilities' (UU) programme management consultant *Montgomery Watson Harza (MWH)* and the detailed civil design work has been undertaken by *Mott McDonald.* The detailed design has been fast tracked to minimise the time taken between plant layouts being finalised by the process contractor, *Biwater Treatment Ltd* and construction by *HMB Alliance,* UUs framework construction partner.

The *HMB Alliance* is responsible for all works for the Cumbria and Ribble areas which stretches from Preston to the Scottish border, covering the Lake District and the Western side of the Pennines.

Framework process

Under the terms of the framework, once the outline design has been completed, a target cost is agreed with the framework contractor, HMB Alliance. This is a joint venture between contractors *Barhale, olker Stevin (formerly Harbour and General) and Morgan Water.*

Detailed designs are prepared for *HMB* by *Carl Bro Mott MacDonald JV* from design offices in Cambridge, Manchesteer, Leeds and Glasgow. For target cost preparation *Mott MacDonald and Carl Bro* staff were located in the *HMB Alliance* office in Preston. *HMB* also entered into an agreement with *Biwater Treatment Limited* to carry out process design, procurement and commissioning. All parties involved have gone to great lengths to ensure that communication is fast and effective. Design meetings were held regularly on site with the construction team and were attended by the lead civil and process design engineers.

Specialist sub-contractors participate when appropriate and this has meant that design intentions, construction constraints and project priorities are fully understood by each party. The client's operational staff are an integral part of this process.

In common with every other UU framework project all drawings and schedules are published on an extranet, BIW, which can be accessed by any individual involved in the project. The extranet not only ensures that all of the team members have the most up-to-date design information available at their workplace but also provides the opportunity for feed back to the designer. Amongst many other functions, the extranet is also the medium for *MWH* to grant approval of the contractor's submisssions.

Completion of the washwater and sludge handling plant was required by the end of September 2004. The remainder of the new works was due to be commissioned and brought into service by the end of March 2005. ■

Note: *The above article was written by Quentin Rea, on behalf of HMB Alliance.*