

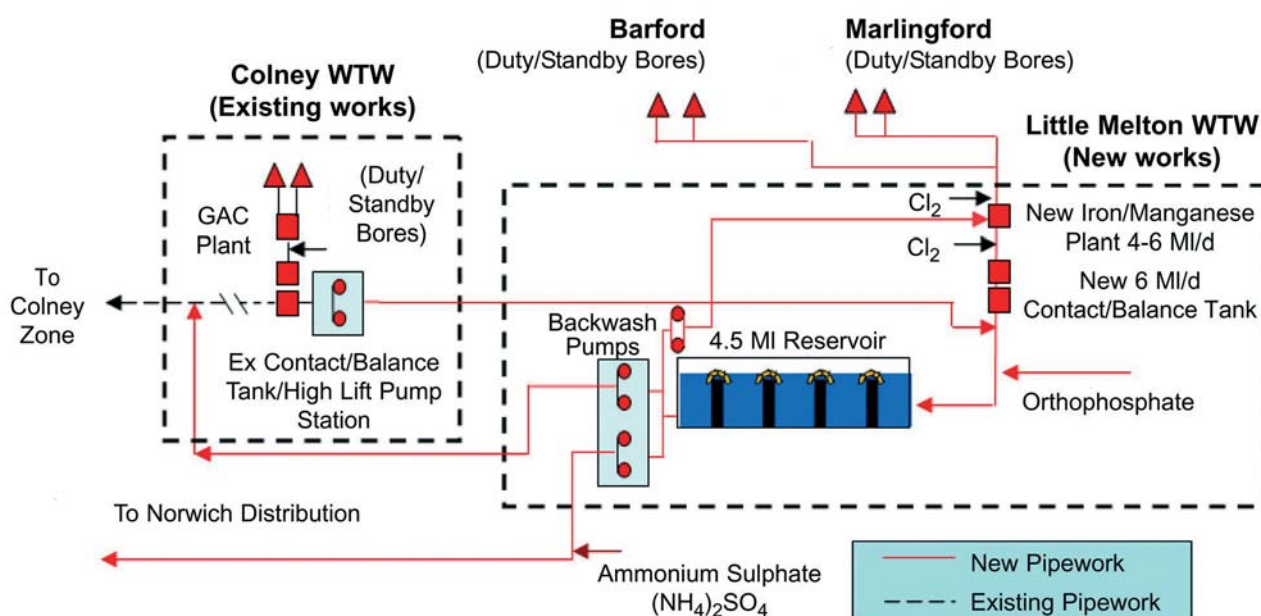
# Colney & Yare Valley Water Treatment Project installation of new water process plant & extensive main laying

by  
Russell Brown & Roger Sanson

**C**olney and Yare Valley is a £10.5m project located approximately five miles to the west of Norwich. An obligation had been made with Ofwat and the DWI to keep rising groundwater nitrate from the existing Colney Water Treatment Works (WTW) within maximum allowable levels. There were also growth and security of supply issues within the Yare Valley area. The purpose of the scheme is to ensure nitrate compliance in the drinking water and supply an extra six million litres of water per day to cater for the additional future demand that will be placed on the Norwich network due to new housing developments. The nitrate limit set by the World Health Organisation is 50mg/l in drinking water and Anglian Water has set a limit of 43mg/l for all its plants.

## PROJECT SCOPE

- Aeration
- Pre filtration oxidation using chlorine
- Rapid Gravity Filtration
- Disinfection using Chlorine/Ammonium Sulphate
- 4.5MI Storage Reservoir and Pumping Station



Schematic showing the scope of the project

courtesy of @one Alliance

The extra 6 MI/d of low nitrate water was proposed to come from two boreholes situated at Barford and Marlingford. On this project, the boreholes were drilled to 80m below ground level. Anglian Water being one of the driest regions in the country, relies heavily on ground water abstraction to sustain the water demands on the network.

### The scheme

The joint solution for both nitrate levels and security of supply was provided by Anglian Water's mandate to build a new 6 MI/d iron and manganese treatment works at Little Melton. The works treats water from two remote borehole sites and blends it with the high nitrate water from Colney WTW. There are incoming pipelines from the two borehole sites and from Colney WTW for blending, with distribution going to both Colney and Norwich. The pipelines installed by Balfour Beatty Utility Solutions, total 17km in length with several directional drill shots; including crossing the A47 dual carriageway and a nearby river.

Each borehole site, one of which is artesian, has two boreholes. The

raw water is pumped into a site pipeline from each site which converge before travelling to the treatment works at Little Melton. The incoming water is treated by aeration and chlorine before entering the Rapid Gravity Filter (RGF) plant and passing into the contact tanks. The contact tank ensures a chlorine contact time of 30 minutes before the water passes to the 4.5MI service reservoir (also split into two halves). Between the contact tank and the reservoir, the water from Colney WTW is introduced, blended and the chemical dosing (orthophosphate) added. The filter plant's backwash water is discharged to a wastewater balance tank before being pumped to sewer. Water is finally pumped out to supply from a high lift pumping station, integral with the reservoir.

### The challenges

Early site investigation had yielded evidence of Iron Age settlement, dating back to between 800 and 300 BC, comprising ditches, pits and post holes. Subsequent archaeological works delayed the start of construction by two months. It was recognised that significant improvements to the programme would be necessary to meet the required dates.



63 metre concrete pump pouring reservoir roof

photo courtesy @one Alliance

From the very beginning the project team's goal was to release each structure at the earliest opportunity for following trades. The strategy was to work on a maximum number of workfaces simultaneously by offering different shutter configurations for the same structure independently and also by constructing in the optimum sequence for workface release.

Prefabrication was used wherever possible to maximise utilisation and minimise working at height. Innovations included custom-made column shutters with an integral scaffold, use of fibre concrete on site access roads. Permadeck® permanent formwork for small roof pours and a single 900m<sup>2</sup> roof pour on the reservoir with a 63m concrete pump (pictured), The shutters for the RGF tanks were designed such that, following the pour of the first half of the tanks, they could be 'flipped' over to pour the second. The number of pours on the tanks was cut from 28 to 10, slashing the construction time.

An increasing inclusion on Anglian Water projects is a boxed out doorway within tank walls to afford ground level access throughout construction. This negates the need for 'up and over' access and craneage and so has a massive health and safety and commercial advantage. At the end of construction the doorways are reinstated using a letterbox shutter.

All civil input to structures was completed on programme mitigating the two months lost to archaeologists.

The MEICA installation was started four months after the civil phase commenced. An integrated supply chain in combination with lessons learnt from previous projects produced an evolved yet familiar design. Subcontractors were involved throughout the design process, including Buildability reviews, and key packages were procured through framework agreements with Anglian Water. This approach is driving the move towards standardisation of equipment and allowing its easy integration; the pre-commissioned "Plug and Play" chemical

dosing kiosk is one example of this.

During the MEICA installation, civil works continued with the laying of interprocess pipework. This meant that labour from all disciplines was on site concurrently. With site attendance peaking at over 70, the daily coordination meeting was vital. It also facilitated a genuine culture of teamwork which was often the solution to daily problems.

#### Undertakings

The work is being undertaken by the @one Alliance, a collaborative organisation comprising Anglian Water Engineering, Balfour Beatty Utility Solutions, Barhale, Biwater Treatment Ltd, Black & Veatch, Grontmij and Skanska-Aker Solutions, which was set up in 2005 to deliver a large part of Anglian Water's AMP4 capital investment programme.

The union of these companies brings together a wealth of experience which is being used to enhance and increase Anglian Water's assets and infrastructure, providing innovative and sustainable solutions and the best value for its customers. By doing so, the @one Alliance is helping Anglian Water fulfil its current supply and treatment obligations as well as make provisions for the increase in demand expected in the future.

#### Conclusion

Throughout its construction, the project has maintained an excellent health and safety record. There have been no reportable accidents and few minor accidents. The scheme was registered with the Considerate Constructors Scheme and received several high scoring and complimentary reports. The project is nearing completion and will go into supply in July 2008.

**Note:** *The Editor and Publishers wish to thank the authors Russell Brown, Civil Site Agent and Roger Sansom, Sub Programme Delivery Manager, both with @one Alliance for providing the above article.■*

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