

South East Water Cryptosporidium Inactivation Projects

a £15.6m programme to install ultra-violet treatment plants at a number of strategic water treatment sites across South East Water's supply area

by Brian Steventon

South East Water's delivery programme for year four of AMP5 required that five water treatment works needed to have a UV facility installed and made operational by the 31 March 2014 in order to comply with the Drinking Water Inspectorate's regulatory requirements for the inactivation of cryptosporidium. Once achieved, and with the successful delivery of four similar requirements over the previous years, nine out of the 10 water treatment works sites would have been completed with the final upgrade due by 31 March 2015. During the course of that year, the delivery contractor, Interserve, was asked to mobilise site teams at each of the five treatment works and proceeded to implement the different stages of design, procurement, installation, testing and commissioning concurrently in order to secure each upgrade without adversely affecting any of the others. This article details the work undertaken at Barcombe, Crowhurst Bridge, Greywell, Arlington and Friston WTWs.



Friston WTW's new strainers and filters - Courtesy of South East Water

Barcombe WTW – project value £6.7m

Situated near Lewes in East Sussex, Barcombe WTW consists of two separate treatment sites. The first was constructed in 1962, the second in 1977 and has a combined maximum output of 75MI/d. It abstracts water from the River Ouse which goes either into the raw water storage reservoir or straight into treatment depending on water quality conditions.

The treatment consists of clarification, rapid gravity filtration (RGF), pesticide removal by ozone, taste and odour control by granulated activated carbon (GAC) filters, disinfection before being pumped from the two contact tanks to a number of storage reservoirs and on into supply.

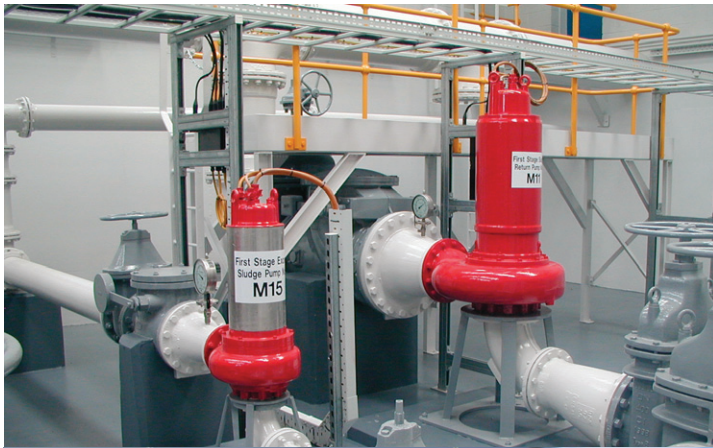
The works supplies potable water to a population of approximately 50,000 in the Sussex area. With planning permission for the UV building granted in 2012, an NEC option C contract was awarded to Interserve in April 2013, which not only covered for the UV facility but also further upgrade work which would affect all areas of the works. The UV building was to be built so water would flow from the GAC into the UV building for treatment and out to a contact tank.

Constructing the new UV building and installing the associated pipework became one of the major challenges that faced the project team because this area was congested with a number of operational cross connections (the largest being 900mm diameter) as well as a number of cable systems.



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The cutting of the existing outlet pipe from the GAC outlet chamber at Barcombe WTW which will enable the new UV irradiated water main to connect onto this main - Courtesy of South East Water

In addition to this, it was a requirement to feed water through the two UV reactors under gravity, thereby eliminating the need for costly relief pumping which would have been difficult to construct alongside the UV building. In order to achieve this, the pipe diameters, before and after the UV building, were increased from the proposed 900mm to 1,200mm.

The resulting pipe system was designed, fabricated, delivered to site and laid whilst avoiding all the existing buried services, thereby negating any need to divert the services.

A 1,900mm diameter opening was created in the GAC outlet chamber but three eight hour shutdowns of the entire treatment works were needed to remove old pipework and connect the new UV building up to the water treatment works system. This allowed all water to be passed through the UV reactors which had been previously installed.

The degree of difficulty of this series of operations was increased as much of this was carried out during the storms of December 2013 and January 2014.

The UV system consisted of duty/standby medium pressure reactors from Xylem and was installed before the control system was assimilated into the existing works control hierarchy and then tested in accordance with a pre-defined testing procedure. After the above final connections were made, the completed UV system was made operational on 21 January 2014, ahead of the required output date.

Crowhurst Bridge WTW – project value £4m

Taking water from the River Rother and from one or more of the site boreholes is Crowhurst Bridge WTW. The extraction licence here permits abstraction from a surface water intake on the river, which is linked by the surface water licence to an augmentation borehole penetrating the Ashdown Beds formation. Under normal operation Crowhurst Bridge directly supports the trunk network, as well as supplying a number of service reservoirs, currently servicing up to 10,359 properties.

Similarly with Barcombe, planning permission for the UV building was granted in 2012. An NEC option A contract was awarded to Interserve in April 2013, which not only covered for the UV facility but also included a substantive number of capital maintenance upgrades affecting all areas of the works.

In addition to that, the contract also covered additional measures (for example, an additional clarifier, to increase its deployable output).

With this contract in place, Interserve set about the design phase and with the procurement phase underway construction of the building began in earnest early autumn 2013.



Installing the new 1,200mm diameter pipework around the new UV building at Barcombe WTW - Courtesy of South East Water

After completion of the various elements that made up the UV facility, including the pressure and bacteriological testing, final connections onto the existing mains were achieved, following a series of operationally sensitive eight hour full works shutdowns. This allowed the follow on site acceptance testing to take place with the UV being put into operation on 26 March 2014.

Greywell WTW – project value £0.9m

At Greywell, located near Basingstoke in Hampshire, raw water is abstracted from the chalk aquifer beneath the site and is fed directly to the contact tank. After disinfection it is then pumped into supply feeding the local populace with approximately 6ML/d of potable water.

Plans have been made that during AMP6 remodelling of water resources this site will be closed down. However because it is currently in use and will be for six years, the provision of a treatment facility for cryptosporidium inactivation would still exist. Due to the short operational life of the UV facility, it was designed to be housed in a shipping container so it could be removed in the future.

Because of the nature of chalk aquifer water, the site suffers from periodic high turbidity spikes which would require additional treatment over the current operational regime in order to ensure the effectiveness of the UV whilst at the same time, not affecting the output from the works. It was decided that a bank of cartridge filters would be installed. In order to reduce excessive blinding of the filters a strainer was also installed with an automatic changeover onto the filters during the high turbidity spikes. This equipment would be housed within a second container.

Due to the picturesque nature of the area and also that the two containers would be highly visible to the local population, a public consultation took place ahead of a planning submission, which resulted in permission being granted in July 2013.



With a NEC option A contract in place with Interserve, various subcontract packages were let and the off-site manufacture of both the UV container from ATG and the filtration container from Amazon began.

Preparatory works began on site late November 2013 and after factory inspection and testing the two containers arrived on site mid-February. The containers were connected to the site's existing works with the two final connections being done in one eight hour shutdown. This allowed the follow on site acceptance testing to take place and both containers went operational on 26 March 2014.

Arlington WTW – project value £2.0m

Originally constructed in 1971, Arlington Water Treatment Works can supply 25ML/d to the community of East Sussex. It abstracts raw water from the River Cuckmere into Arlington storage reservoir ahead of treatment at the works. Treatment consists of clarification,





The three pipe manifolds in the Ultra Violet treatment room at Arlington WTW - Courtesy of South East Water



The new Ultra Violet plant installed at Barcombe Courtesy of South East Water



The new UV reactor at Friston WTW being commissioned Courtesy of South East Water

rapid gravity filtration (RGF), pesticide removal by ozone, taste and odour control by granulated activated carbon (GAC) filters and disinfection. Treated water is then pumped into supply.

With planning permission granted in 2012, a purpose built building was constructed adjacent to the existing GAC filters and the ozone building which was an ideal location for providing UV treatment between the GAC filters and the contact tank.

Three low pressure Xylem UV reactors were required acting in a duty/assist/standby formation. As with Barcombe WTW, careful consideration of the hydraulic profile enabled the plant to operate under gravity conditions and relift pumping was avoided.

With a NEC option C contract being in place by April 2013, Interserve set to work and after completing the design phase and with the procurement already underway, construction of the building began in earnest early autumn 2013; however laying the various 700mm diameter pipe sections was hampered by the storms of 2014.

Notwithstanding this, and after completion of the various elements that made up the UV facilities, including the pressure and bacteriological testing, final connections onto the existing mains were made during an eight hour shutdown. This allowed the follow on site acceptance testing to take place and the UV plant went operational on 27 March 2014.

Friston WTW – project value £2.0m

Serving a population of approximately 37,000 Friston WTW is located to the east of Eastbourne, East Sussex. It draws water from underground adits which are located directly below the pumphouse.

The only treatment required on site, prior to the UV system, was phosphate dosing and disinfection. Within the existing pump house, sufficient empty space was available to house the UV system and consequently no new building would be required for this site.

As with Greywell, the site suffers from periodic high turbidity spikes which would require additional treatment over the current operational regime in order to ensure the effectiveness of the UV. A strainer and bank of cartridge filters were installed operating on an automatic changeover as per Greywell.

In a similar fashion to both Barcombe and Crowhurst Bridge WTW, the site was scheduled for some capital maintenance upgrades in the same year and these were amalgamated into one single NEC Option C with Interserve early in July 2013. Work then began in earnest to provide both the filtration system from Amazon and the duty/standby low pressure reactors from Xylem.

The challenging issues to this project were both the degree of unknown buried services and also the storms that affected the area. The combination of both of these factors resulted in a number of very determined individuals undertaking a significant amount hand digging in difficult, wet conditions to enable the twin 500mm pipelines to be laid.

Notwithstanding this, and after completion of the various elements that made up the UV facility, including the pressure and bacteriological testing, final connections onto the existing mains were made during two eight hour shutdowns at the WTW.

This allowed the follow-on site acceptance testing to take place and the Friston WTW UV plant went operational on 31 March 2014, six hours prior to the DWI regulatory output date.

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