Leigh WwTW – AMP3 improvements
new BAFF plant benefits local environment

Leigh WwTW, located off the East Lancashire Road at Leigh, Lancashire, serves a population equivalent of approximately 95,000. It has an average daily throughput of 127 megalitres per day, discharging into the Pennington Brook and River Glaze. Influent sewage from the works catchment passes through an overflow chamber and is lifted up into the inlet channels by a single screw pump allowing water to gravitate through escalator screens, onto the detritor and into a series of traditional trickling biological filters, ending at the humus tanks prior to discharge. The purpose of this project for United Utilities was to improve the quality of final effluent through the provision of tertiary treatment.

Leigh WwTW: New BAFF plant under construction courtesy Norwest Holst

The required process improvements are designed to both ensure compliance with revised Environment Agency consent standards affecting the works outfall discharges and provide increased benefit to the local environment.

Scope of the contract, defined by *MWH* and undertaken by *Norwest Holst,* in association with *Pick Everard* as designers, is to construct a BAFF Feed Pumping Station, BAFF Plant, dirty washwater tank, flow distribution chamber, pipelines to link the structures and the existing plant in addition to extensive modifications to the existing inlet works.

The BAFF plant, provided by *Brightwater Engineering Ltd* under a nominated supplier agreement with United Utilities, comprises a structure approximately 47m long, 12m wide and 6m high. A dirty washwater tank is provided at one end of the structure to balance the backwash water before return by pumping to the head of the works upstream of the primary tanks for co-settlement of sludge. It is to be built on a green field part of the existing works.

The level of the structure was optimised between minimisation of required pumping head for the BAFF feed pumps to provide savings in operating costs for the client, and limiting the depth of foundation

level due to high levels of ground water. A tight construction programme was required to deliver the structure for mechanical and electrical fit-out.

In order to meet the required EA consent figure, all of the existing full flow to treatment must pass through the new BAFF plant. Final effluent from the humus tanks is diverted to the new feed pumping station immediately upstream of the existing biological filter recirculation pumping station. The BAFF feed pumping station comprises an 8m deep structure with three mixed flow suspended bowl pumps operating in a duty/assist/standby arrangement.

Flowrates delivered to the high level distribution chamber via a 700mm dia. pumping main to the BAFF vary between the minimum flow of 200 l/s delivered by a single pump to 650 l/s delivered by two pumps. A physical model of the new pumping station wet well was constructed and tested to ensure efficient performance of the pumps. Final effluent is to enter the pumping station via a weir formed in the existing final effluent channel with temporary over pumping required to make the final connection.

The high level distribution chamber distributes effluent evenly to the base of each of four Biobead BAFF reactors. Upon entering the base of the reactor, flow is distributed by a channel with large area jetting nozzles, before rising through the media bed. Media comprises buoyant plastic media with a special surface to encourage attachment of bacteria, the media has a lower unaerated pre-filtration zone to filter suspended solids below a process aeration grid through which air is supplied. The media above the process aeration grid comprises the biological treatment zone to promote biomass growth. Flow passes through the stainless steel media retaining mesh into a top treated effluent zone to be discharged via a weir to outfall.

The reactors also include an air scour system used during the backwash cycle. Following the air scour cycle to remove excess biomass from the media, de-sludging to the backwash tank is carried out under gravity utilising the stored volume of treated effluent above the media retention grid to displace the sludge from the base of the reactor to the dirty backwash tank. Process and scour air is provided by three variable speed positive displacement air blowers.

This method of tertiary treatment is designed to achieve 95%ile compliance with the consent of 10mg/l BOD: 25 mg/l SS and 2mg/l Ammonia (NH_4-N).

The contract includes modifications to the inlet works involving the construction of a third inlet screen channel. The channel starts outside the screenhouse, passes through the existing building and is approximately two metres below ground level. Operation of the existing works has to be maintained throughout the contract.

Norwest Holst Construction Ltd have worked closely with *United Utilities Operations Team* in order to manage the interface between the existing plant and construction activities. This requires a high level of planning and co-ordination with the client, particularly for work within the screenhouse. Regular consultation with *UU* and *MWH* was required since maintaining throughput on the existing plant was of the highest priority.

Once construction in the screenhouse is complete and the new third screen and screen handling facility is in place the two existing screens have to be replaced.

This EEC Option C contract was won in competition on a target lump sum of approximately £4m. However, through value engineering and innovation, the construction team has been able to offer the client savings in both capital and whole life costs and reduced time on the programme. ■

Note: *The Editor & Publishers thank Norwest Holst Construction Ltd & Pick Everard for the above article.*