Ballyclare WwTW

£9.5M scheme for Northern Ireland

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As well as a replacement for the existing waste water treatment plant, the 84 week Ballyclare Waste Water Treatment project in County Antrim includes construction of two new satellite pumping stations; provision of additional treatment capacity and improvements in the quality of final effluent. Drivers for the scheme are compliance with statutory requirements and the projected high growth in the population over the next 25 years in Ballyclare and the surrounding communities.

New Ballyclare WwTW under construction *courtesy: Dept of Regional Development Water Service NI & Biwater Graham JV*

The scheme was awarded as a design, build and operate contract to *Biwater Graham Joint Venture,* which is responsible for the full design construction, installation and commissioning of the plant, and for its operation for two years following completion.

As well as Ballyclare the surrounding communities of Doagh, Kilbride, Ballyrobert, Ballyeaston, Ballynure and Straid will be served by the new WwTW. It was decided to pump flows from the latter two locations to Ballyclare for improved treatment rather than upgrading treatment at source.

The new Ballyclare works will receive domestic and industrial flows from the catchment area via the local sewer network, together with the pumped flows from Straid and Ballynure. The works is sized for a projected 2015 Full Flow to Treatment (FFT) of 12,708m^3/d. and is upgradeable by the addition of further equipment to the projected 2030 flows of 13, 272m^3/d.

Protecting the water quality in the receiving Six Mile Water, which is an environmentally sensitive salmon river, was a major consideration for the project. To meet this requirement, the process incorporates the most up-to-date membrane technology using ultra-fine filters to remove pollutants, including bacteria and viruses.

In order to minimise excavation and reduce the risk of flooding of the process units, the design philosophy was based on elevation of most of the treatment structures and pumping of flows to the preliminary treatment stage, followed by gravity discharge through the works up to permeate withdrawal at the MBR membranes.

Process description

Incoming flows pass through a rotating bar imterceptor at the head of the inlet pump station, where pH is checked. In the event of any illegal discharges the flow is automatically diverted to the storm tank via the inlet works. The pump station then raises the flow to a high level inlet works, where it passes through a 6mm bi-directional screen and a vortex-type grit trap that removes 95% of the grit down to 200 microns.

De-gritted flows are measured by a flume to BS3680 operating in conjunction with an upstream modulating actuated flow control penstock that discharges flows greater than FFT via a weir plate to the storm tank.

The storm tank is open and built to a rectangular format to allow for future extension. A mixing unit keeps solids in suspension, and variable speed submersible pumps return flows to the inlet works when the storm abates. Overflows from the storm tank pass via the combined final effluent and storm outfall to Six Mile Water above river flood level.

Following preliminary treatment, flows gravitate for primary settlement to three lamella clarifiers, which discharge through 1mm fine screens into anoxic/aeration tanks, which are sized to carry out biological removal of BOD and ammonia at a loading rate of 0.07kg BOD/kg MLSS at a design MLSS of 8,000mg/l.

For the final stage of the treatment process, aerated liquors gravitate to a manifold system for distribution to six membrane bio reactor lanes, each housing three Zenon cassettes.

Permeate is pumped from the membrane cassettes and delivered to the back pulse tank, from which it is discharged into Six Mile Water. The target quality of the effluent will be better than a BOD of 11mg/l. Suspended Solids of 15mg/l, Ammonia of 1.5mg/l and Phosphate of 1mg/l.

Concentration of mixed liquors in the MBR lanes is prevented by a re-cycle which returns flows at 4 x FFT from the lanes to the aeration tank inlet. There are four measures of fouling prevention to maintain the integrity of the membranes:

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* continuous air scouring of the lanes on-line keeps the membrane cassettes clean;
* a 30 second back-pulse every five minutes returns permeate from the back-pulse tank through the membranes to remove adhered sludge and small particulate material that could block membrane pores;
* a maintenance clean in air or mixed liquors of up to an hour is initiated automatically as required;
* and a 24 hour recovery clean is undertaken every 12-18 months, normally during periods of dry weather or low flow.

Sludge handling & odour control

Primary settled sludge from the lamellas, together with surplus activated sludge from the MBR system, is blended together and thickened by a DAB thickener. The thickened sludge is retained in a sludge storage tank for tanker removal, and for decanting of top liquors back to the inlet works.With the exception of the storm tank and the aeration lanes, all sources of odour are covered in order to meet the standard of 1ppb at the boundary of the works. Odour control is by means of catalytic iron, carbon and biofilters.

Other facilities

Associated process plant includes citric and hypochlorite dosing skids for the washing of the membrane, a ferric dosing system for phosphate removal at the inlet channel to the lamellas, and blowers for aeration and for cleaning the MBR strands. There is also stand by diesel generation and a comprehensive control system using *Profibus* technology.

The site is fully automated. Completion is expected in the Autumn of 2005. ■

Note on the author: *David Rome is Programme Manager at Biwater Graham JV.*