

# Belfast North Shore Project

## Carrickfergus & Whitehouse WwTW's

by  
**Jane Chambers**

**T**he Department for Regional Development, Water Service, is responsible for the delivery of Water and Wastewater services throughout Northern Ireland. The obligations placed on all providers of wastewater services within the EU by the Urban Waste Water Treatment Directive 91/271/EEC is enforced in Northern Ireland through the Urban Waste Water Treatment Regulations (NI) 1995. To comply with these regulations, Water Service has embarked on an ambitious programme to upgrade its wastewater treatment and collection systems. Within Water Services Eastern Region, there are two major treatment works, one at Carrickfergus and the other at Whitehouse. Each is situated on the North Shore of Belfast Lough and require major upgrading to provide secondary treatment. Both works were under threat of European infraction proceedings and in August 2004, a decision was taken to upgrade each to provide secondary treatment.



Carrickfergus WwTW: £7.9m project under construction

*photo courtesy White Young Green*

### Procurement

The upgrading works are being procured through Water Service's integrated wastewater framework, and the task of developing a solution for both locations came to the Eastern Region Project Management team comprising White Young Green, RPS and EC Harris and the design and build contracting team, Biwater-Graham Joint Venture.

### Whitehouse

This is an £11 million contract to expand the existing treatment works to provide secondary treatment. Within the design of the treatment works, no alterations were needed to the existing inlet works, storm and primary treatment. However, major works were

required to provide secondary treatment at Whitehouse.

These upgrade works include the following key components and associated features:

- \* secondary treatment for 100,000 pe, with operational flexibility to treat in the range from 80,000 to 120,000 pe;
- \* interstage pumping station;
- \* four lane aeration tank which contains a fine bubble diffusion system with aeration taper via four activated control valves controlled by dissolved oxygen probes.
- \* Oxygen is supplied by VSD blowers.
- \* flow distribution chamber which splits flows evenly via manually adjusted penstocks to the final settlement tanks;



Whitehouse: £11 million expansion of WwTW

*photo courtesy White Young Green*

- \* four 30m dia. final settlement tanks with half bridge scrapers;
- \* ASP flow distribution chamber;
- \* sludge and liquors treatment including pumping stations, return works liquors, buffer tanks, sludge thickeners, thickened sludge storage, and polyelectrolyte dosing;
- \* odour control.

Some points of note on the process design are:

- \* Returned Activated Sludge (RAS) is removed from the FST via bell mouths to the RAS chamber. Three RAS pumps are provided running duty/assist/standby which deliver RAS to the aeration flow distribution chamber;
- \* two progressive cavity Surplus Activated Sludge (SAS) pumps draw from the RAS pipework and pump SAS to a buffer tank;
- \* the new sludge plant consists of two surplus activated sludge buffer tanks. Two thickener feed pumps draw from the SAS buffer tanks and feed the two sludge thickeners;
- \* two thickened sludge pumps feed the thickened sludge tank, and a fully automated polymer, make up and dosing plant are also incorporated;
- \* a new works liquor pumping station is provided to capture the liquors from the sludge plant;
- \* a final effluent booster set is provided to supply the sludge thickeners, odour control irrigation and final polymer dilution;
- \* the close proximity of new domestic housing triggered the need for odour control to be provided at the sludge tanks;

### Complications

The design for and construction at the site were not without complications. The ground conditions are extremely poor with

coarse grained made-ground and recent estuarine deposits. Groundwater is present at approximately one metre below ground level and the flows are tidal. Ground improvements and hard driven piling were used to support the new structures.

The site's coastal location and close proximity to residential development ensured visual and environmental impacts were given careful and detailed consideration when planning the layout of the site. At the time of writing, construction of these works was running fifteen weeks ahead of programme.

### Carrickfergus

This scheme was developed under the same compliance drivers as for Whitehouse. It is a secondary treatment scheme to an existing Waste Water Treatment Works, with a contract valued of £7.9m.

The upgrade works to Carrickfergus include the following:

- \* secondary treatment for 35,330 pe.
- \* interstage pumping station;
- \* 4 lane aeration tank, which contains a fine bubble diffusion system with aeration taper via 4 activated control valves, controlled by dissolved oxygen probes. Oxygen is supplied by VSD blowers;
- \* flow distribution chamber which splits flows evenly via manually adjusted penstocks to the final settlement tanks;
- \* four 20.7m dia. final settlement tanks with half bridge scrapers;
- \* ASP Flow Distribution Chamber;
- \* sludge and liquors treatment including RAS/SAS pumping station, scum pumping station, return works liquors, SAS buffer tank, sludge thickeners, thickened sludge storage, and polyelectrolyte dosing;

- \* Odour control;
- \* storm tanks as converted existing primary tanks.

The above list indicates that this project differs from Whitehouse in that the existing inlet works needed to be altered to include fine screening upstream of the existing inlet works. Coarse screens are installed on an emergency overflow. In addition, the storm tanks at Carrickfergus have been provided by converting four of the eight existing primary tanks.

The works are designed for flows to full treatment (FFT) of up to three time dry weather flow, via the four existing primary settlement tanks (PSTs) and secondary treatment. Flows enter PSTs via the Flow to Full Treatment (FFT) flume and control penstock; flows in excess of 3DWF spill over an existing storm weir and gravitate to the four newly converted storm tanks. Once the capacity of the storm tanks is

reached, the flow gravitates to the existing long sea outfall.

From the existing PSTs, FFT enters the new secondary treatment. Sampling for compliance monitoring is via a new sample chamber after which flows gravitate to the existing outfall.

The site infrastructure is also being upgraded to include new pipelines, roadways and landscaping.

The visual aspects of this scheme are extremely important; the works are low lying, in a residential area and visible from the road. Careful design has ensured visual impact is minimised, and in keeping with the existing works, the new FSTs have been constructed 900mm above the ground surface and similarly the aeration tanks 1.5m above.

Ground conditions at the site are poor, similar in nature to those of Whitehouse. It consists of made ground with the depth varying from one metre to four metres overlying approximately two metres of coarse grained material, overlying glacial till, with bearing capacity in the firm to stiff range. There is also the problem with groundwater and tidal flow at this site. Generally, the foundations of the main structures have been taken down to the glacial till layer, which has negated the need for any piling. However, in the sludge treatment area, stone columns have been used to enhance the bearing capacity of the ground.

At time of writing construction of this project is running four weeks ahead of programme.

The commissioning of Carrickfergus WwTW is already underway. It commenced on 02/05/06 and is due to be completed on 27/09/06. The works shall be put into service after this completion date.

The forecasted completion date is 29th September 2006, which is four weeks ahead of programme.

The commissioning of Whitehouse WwTW is due to commence 22/06/06 and finish on 06/12/06. The works shall be put into service after this date, which is fifteen weeks ahead of programme ■

The Project Management team comprises: *White Young Green*, Belfast, as Project Managers; *RPS (Cork)*, Specialist Treatment Advisors/Consultants; *EC Harris* as Cost Consultants; *WYG Limerick* are in charge of the network side of the scheme.

**Client:** Water Service (NI)  
**Design & Build Contractor:** Biwater Graham JV

**Note:** The author of this article, Jane Chambers, is Project Manager, Regional Director, White Young Green.

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