

Hamilton Sewage Treatment Project

£5m project is final part of scheme to clean up River Clyde

by
Kenny Dallas

Work to improve sewage treatment facilities at Hamilton, 11 miles South East of Glasgow, was part of a wider investment programme aimed at reversing the effects of decades of pollution from industry along the banks of the Clyde. The Clyde six cluster of projects, which also includes work at Allers, Carbarns, Daldowie, Bothwell Bank and Dalmarnock, is aimed at improving ammonia levels in the river and Hamilton was the final project to get underway.



Hamilton STW: New nitrifying activated sludge plant at start of commissioning

courtesy Scottish Water Solutions

As well as attracting the return of salmon to stretches of the Clyde, the combined investment will also help to improve the environment in the area for other wildlife including birds such as the red shank and kingfisher and Otters.

The Clyde is already now recognised as one of the premier wildlife sites for overwintering birds in Europe and the area from Clydebank to Port Glasgow is designated as a Special Protection Area under the EC Wild Birds Directive. Wading birds like redshanks as well as ducks such as goldeneye and eider can be spotted and further out to sea red-throated divers, curlew and cormorants are common. Kingfishers and otters are also making a comeback as the river gets cleaner.

Environmental issues

The only viable option for the site was a woodland located in between a Site of Special Scientific Importance (SSSI) and a Site of Importance for Nature Conservation (SINC). Wildlife in the area includes badgers and bats.

Ecological impact assessments were needed from the earliest stages and, although planning approval was granted in August 2005, a number of environmental conditions had to be satisfied before work could start.

Solutions worked closely with consultants RPS to develop a Woodland Management Plan to remove trees in a 'Bat and Bird

Friendly' manner and erect nesting boxes at suitable locations to mitigate any loss of potential nesting sites. Plans for areas of roosting and foraging for bats were also drawn up along with a land management strategy to detail landscaping and the re-planting of shrubs and trees.

The work led to conditions on the planning application being met and work began on site the day after permission was granted by the council.

Existing works

Hamilton wastewater treatment works was consented to discharge treated effluent from a population equivalent of 57,000 into the River Clyde.

The existing consent requires a 95% effluent standard of 20mg/l BOD and 30mg/l SS, and from April 2005 included a requirement to reduce ammonia to <5mg/l.

In addition to the need to address the nitrification requirement, the works had suffered a number of exceedences in the three years leading up to work starting - two lower tier BOD failures and one lower tier SS failure. Known issues with the existing works included unsatisfactory inlet screenings handling, inadequate storm screening, little or no storm water storage due to structural problems in existing tanks and poor performance of aeration equipment and dissolved oxygen control.



The new rising main (right) feeding the activated sludge plant and the return main (left)



The existing primary settlement tanks with the new activated sludge plant rising main in the background

Existing flows entered the works through a gravity sewer and flow in excess of 6DWF (Dry Weather Flow) discharged through a 40mm bar screen to the River Clyde. After screening through two 6mm screens, all flows <6DWF passed to a grit removal unit. After grit removal, flow in excess of 3DWF passes to the river. The existing storm tanks had not been used for many years due to their poor condition.

All flow up to 3DWF passed on to three rectangular primary sedimentation tanks. A fourth existing sedimentation tank had not been in service for many years and was not fit for use.

Primary settled sewage passed on to an activated sludge plant. After aeration, the mixed liquor was settled in three circular final settlement tanks and the settled sludge removed by a siphon arrangement. The surplus activated sludge was wasted to the primary sedimentation tanks and the co-settled sludge thickened and removed from site for treatment.

Investment/Scope

To meet the drivers, the Stakeholders identified several options. These options were subjected to project value Scoping Workshops and a solution was agreed in early 2005 in close liaison with Scottish Water, SEPA and council planners.

The scope was defined and presented to Scottish Water in June 2005. The £5m budget was agreed and the design was progressed by Scottish Water Solutions in order to meet a start on site date in December 2005.

The scope includes;

- * enhanced inlet works to improve flow measurement and spill accuracy;
- * 3 million litres of Storm Storage and auto storm water return;
- * 2500 l/s 6mm Storm Screening Plant;
- * flow monitoring and Storm Event recording;
- * auto-de-sludging of Primary Settlement Tanks;
- * new transfer pumping station & 1000mm rising main (PST to ASP);
- * new Nitrifying Activated Sludge Plant;
- * refurbished RAS Archimedes Screw Pumping Station;
- * 2 new motor control centres;
- * SCADA complete with operator interface;
- * telemetry interface.

Flows >6DWF are now screened using a Longwood Stormguard Screen before discharge to the Clyde. Flows then pass forward for

fine screening, after which >3DWF is transferred to Storm Tanks and returned automatically to the works inlet after the storm event, utilising pumps supplied by *Flygt*. The sequence for emptying includes mixing of the contents of the tanks to ensure sedimentation is minimised and emptying controlled by the inlet Magnetic flow meter supplied by *Flowline*.

The FFT (full flow to treatment) receives grit settlement/removal before passing to forward for primary settlement and timed auto-desludging.

Improvements to the works inlet were carried out in order to improve the flow measurement and spilling accuracy. Modulating penstocks were used to achieve this as the inlet does not allow for the construction of an open channel flume.

Biological treatment

The existing aeration tanks were de-commissioned. The new activated sludge plant, using Fine Bubble Diffusion, comprises of a 360m³ selector zone into which the returned activated sludge (RAS) enters. Sub-surface mixer pumps ensure that the two streams will be completely mixed in a short time.

The ASP consists of three individual, equivalent lanes each of 55m length, 10m width and 6m water depth, which will operate at a MLSS (mixed liquor suspended solids) concentration of 3500 mg/l. Aeration provided by *Brightwater Engineering* utilises tapered diffused aerators along the floor of each lane. Each lane is zoned into three areas of diffuser intensity and aeration will be controlled by dissolved oxygen probes in zones one and three.

Final settlement tanks

The Treated MLSS flows into the three existing FSTs where the biomass is allowed to settle. The biomass, returned activated sludge (RAS) is continuously removed by the existing siphon arrangement. *Flygt* supplied pumps to transfer the RAS along with the primary settled sewage back to the selector zone and surplus activated sludge (SAS) is wasted on a timed basis and returned to the inlet works for co-settlement in the PSTs.

The partnering team consisted of Client: Scottish Water, Designer: Scottish Water Solutions, Civil Contractor: Gleeson/Black & Veatch. ■

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