Banbridge C.Down WwTP

new plant doubles capacity on existing restricted site

by

Mark Hayton BSc (Hons), CEng, MICE, MCIWEM

Located on the edge of the town of Banbridge Co. Down, Northern Ireland, the WwTP receives flows from the town and associated areas. Effluent from the plant enters the River Bann that feeds into the sensitive waters of Lough Neagh. Upgraded through several phases of modification, the existing Banbridge Wastewater Treatment Plant (WwTP) has reached its limit requiring a considered approach to the reconstruction.

Construction of CASS™ basins & inlet works at western end of site *(courtesy: Earth Tech Engineering Ltd)*

Flow entering the existing plant, expressed as a total population equivalent, is between 15,000 to 18,000. This is anticipated to rise to 40,000 following reconstruction and the completion of various follow-on schemes.

Existing plant

Banbridge WwTP is a traditional percolating filter treatment works that has been developed in various phases over the last 40 years.

Components of the existing works:

* inlet works consisting of 6mm band screens, grit removal plant and flow measurement;
* primary tanks 17m diameter (1) and 13m diameter (2);
* percolating filters 24m diameter (2) and 18m diameter "clover leaf" percolating filters (4);
* humus tank 24m diameter;
* storm tank 22m diameter with storm return pumping station;
* sludge pumping station;
* picket fence thickener;
* sludge digester & associated plant (not operational);
* primary sludge holding tank (7);
* sludge pump house for pumping both primary & humus sludge.

Challenge

Development of the existing site had been achieved by adding additional treatment units, pipework and distribution chamber such that the whole area of the site had been brought into use. Surrounding land is in use as residential housing and this prevented any increase in the area of the site. The challenge facing the design team was not only to design a plant with over double the capacity of the existing works but to produce a layout that could be built whilst maintaining the existing works in operation. Allowance would have to be provided for the safe operation by the client's operatives and access for road tankers to remove sludge from the site.

Reconstruction - the reason

Having become hydraulically and biologically overloaded the existing plant was no longer capable of reliably meeting the Registered Discharge Standard. The utilisation of all the available site area and requirements of the EC Urban Waste Water Treatment Regulations would require reconstruction of the plant.

Project team

Department of Regional Development (NI) Water Service let a fixed price modified IChemE 'red book' contract for the reconstruction. The contract was awarded to the *Earth Tech/Farrans* joint venture

early in 2001. From the outset, it was recognised that a teamwork approach would be required to ensure that the requirements of all parties were accounted for.

Design
Earth Tech's Cyclic Advanced Sludge System (CASS™) was selected as the preferred process. Limited space on the site made this process particularly attractive given the requirement to retain existing plant in operation whilst building the new treatment units. During the design stage the team produced detailed design basis, general method statement and reviewed the proposals at a plant Hazard & Operability (HAZOP) study.

Components of the new plant:

* new inlet sewer;
* inlet flow measurement, splitting and storm screening;
* inlet works consisting of 6mm screens, grit and grease removal plant;
* CASS™ basins 27m diameter (4);
* outlet flow measurement & sampling;
* surplus activated sludge storage tanks;
* building housing drum thickeners (2);
* thickened sludge storage tanks (2);
* return pumping stations;
* storm tanks (2);
* administration building;
* standby generator building;
* air blowers building.

Enabling works
Enabling works were undertaken to prepare the eastern end of the site for construction. An existing administration building and a compound housing the power supply transformer occupied this area,

An upgraded transformer and HV switch required for the new plant was installed early and used to provide temporary power to the existing works, allowing the removal of existing overhead lines to provide safe access for construction activities.

Relocation of the client's operatives to an off-site depot allowed demolition of the existing administration building and transformer compound. Existing polymer and ferric dosing equipment was temporarily relocated on the site.

These enabling works allowed construction of the new thickened sludge holding tanks and associated works. Following modifications to the existing pipework, sludge from the existing plant could be pumped to the new sludge storage tanks for gravity thickening prior to removal from site by road tankers.

Demolition of the existing sludge treatment facilities could then be progressed, clearing the western end of the site for construction of the new CASS™ basins and inlet works.

Construction
Space at the western end of the site was very tight requiring careful planning not only to position the treatment units but also to allow for the construction of underground pipework. The basins were constructed in sequence between the existing treatment units and the site boundary. The new inlet works were then constructed. Movements and positioning of construction equipment was particularly critical in determining the sequence of construction.

Commissioning

Commissioning of the CASS™ process was achieved by importing seed sludge and by diverting load from the existing plant via the new inlet works. By aerating and slowly filling the basins over a period of eight days, the treatment capacity of the CASS™ process was built up to exceed the performance of the existing works. This allowed the new process to attain the required standard of treatment prior to discharge to the River Bann. Following the generation of surplus activated sludge the drum thickeners could be commissioned.

Completion works

Following commissioning of the new process, the existing humus tank and storm tank can be converted for storm water treatment. Finally, the existing works can be demolished and roads and landscaping completed.

Conclusion

The *Earth Tech/Farrans* joint venture working closely with *Water Service* design group and operations staff developed a design and programme for reconstructing Banbridge WwTP in a continuous sequence without staged construction of the main process units. Agreement of the design ensured minimal impact on the operation of the existing works, ensuring compliance with the existing discharge consent during construction. The design also enabled the new works to be constructed in a continuous sequence providing advantages in overall programme and early beneficial use of the new works.

Take over testing commenced in April 2003.■

Note: *The author of this article, Mark Hayton, is a Chartered Civil Engineer and Project Manager for Earth Tech Engineering Limited.*