Morestead Road (Winchester) WwTW

Southern Water doubles wastewater treatment capacity at Winchester to provide for future population growth

by Jon Kenrick & Carl Gibson

Southern Water's Morestead Road WwTW near Winchester has been significantly upgraded. Constructed in the 1950s and extended in the 1990s, the site previously served a population equivalent of 46,106. However, this is expected to rise to 52,616 by 2020. The initial project requirements included a 50% rise in the Flow to Full Treatment (FFT) from 193l/s to 285l/s, new 5mg/l Ammonia and 15mg/l Total Inorganic Nitrogen (TIN) and 1mg/l annual average P discharge consents, with a compliance date of December 2013. The key challenges included location within a sensitive national park site with considerable space constraints, surrounded by roads and soakaway ditches on all sides. The works also had to remain fully operational throughout the construction period.

Morestead Road (Winchester) WwTW - Courtesy of Southern Water

BioWin modelling

The process design basis and activated sludge plant (ASP) volume for the TIN consent were determined through BioWin modelling, a wastewater treatment process simulator that ties together biological, chemical, and physical process models. Design features such as internal recirculation were incorporated to give flexibility of plant performance while retaining the ability to realise capital and operational cost savings in the event of a successful challenge.

The work comprised

- Modification to the works return pipe, in order to return to the flow splitting chamber.
- Installation of ferric storage and dosing system.
- Installation of three additional aeration feed pipes.
- Modification to the existing aeration tank to create three separate anoxic zones and one aeration zone; new mixers will be installed within the anoxic zones and a new fine bubble diffuser system will be installed within the aeration zone.
- Construction of an additional three-lane aeration tank, inclusive of a new fine bubble diffuser system and an integral drain down pumping station.
- Construction of a new final settlement tank and distribution chamber including connections to the new and existing tanks.
- Construction of a RAS pumping station and rising main to return activated sludge from the final settlement tank to the aeration distribution tank.
- Construction of a new final effluent monitoring chamber.
- Construction of an additional sludge storage tank with external mixer system.
- Installation of external mixer system to existing sludge storage tank.

- Installation of increased capacity final effluent pumps (250kW each).
- Modification to final effluent discharge locations to comply with new consent requirements.
- Installation of 2 (No.) new motor control centres.

Activated sludge plant

The additional ASP capacity to meet the new TIN and Ammonia consents was constructed on a redundant sludge lagoon. To make this possible, reptiles were removed from the lagoon area and a reptile fence was erected around the construction area. Inert contaminated waste was removed from the redundant sludge lagoon to enable construction of the ASP.

The soakaway, a series of interconnecting drainage ditches, was remodelled to allow the construction of an additional final settlement tank (FST) to accommodate the increase in flow. Where any visual screening was removed to allow construction, this was re-landscaped and planted after construction. The earthworks were considered as part of the design such that all suitable excavated material was reused.

As well as increasing the capacity of the ASP, the existing structure was modified to provide anoxic and aeration volumes to suit the new process configuration. The existing tank was re-fitted with new fine bubble diffused aeration (FBDA) equipment and mixers. In order to maintain full operation of the works during modifications to the existing structure, the construction sequence incorporated a phased conversion of the existing and early commissioning of the new tanks.

Consent challenge process

During the consent challenge process, the EA reviewed the borehole data supplied and concluded that the new TIN consent could be removed. The revised EA Permit Variation was confirmed in June 2012, allowing omission of the internal recycle pumping station from the design and reduced aeration requirements, resulting in substantial capital cost saving and annual operational cost savings of £24,300.

In order to reduce a perceived risk of hand-arm vibration syndrome (HAVS) we raised awareness through toolbox talks and deployed HAVS meters to accurately record, report and manage workers' exposure to vibration. In addition, a collaborative approach to Risk Assessments and Method Statements was adopted by the site management team, which encouraged early input from operatives on forthcoming tasks and raised risk awareness. The works were completed with no lost-time incidents in an 18 month period during which over 55,000 man-hours were worked.

Considerate design

The location of the WwTW, which is also overlooked by a number of residential properties, meant that visual screening needed to be enhanced or maintained from all perspectives to meet the planning requirements. The design considered the effect on the views across the site when locating the new structures, plant, and equipment. Wherever possible, new elements were positioned to blend with the surrounding landscape and no mature trees were removed or disrupted during the project.

Summary/conclusion

The project was delivered to programme and under the £9m budget, delivering compliant treatment before December 2013, and was successfully handed over to Southern Water in March 2014. Access for birdwatchers to a lake was maintained throughout the project.

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New final settlement tank - Floor construction
Courtesy of Southern Water

New final settlement tank - Courtesy of Southern Water

New activated sludge plant - Early construction/excavation support
Courtesy of Southern Water

New and existing ASPs - Courtesy of Southern Water