

# Hulland Ward STW

## first use of Phragmifiltre® in the UK in the installation of a constructed wetland as a full treatment facility at a sewage works recognises TOTEX benefits

by Mark Slatcher, Adrian Woods & Dan Cuncliffe

**H**ulland Ward STW is located in the heart of the Derbyshire Dales, some 15 miles north-west of Derby. The site currently treats wastewater from a population of around 900 and discharges to the Ecclesbourne catchment area. The site was originally built in the 1960s and in 2014 Severn Trent Water started work at the treatment works to replace the 50-year old conventional, biological filter works with a new reed bed process consisting of both primary and secondary treatment. The project is part of Severn Trent Water's capital investment programme for AMP5 and has a value of £1.35m.



The final Phragmifiltre® reed bed system in place - Courtesy of MWH Treatment

### The need for change

The existing works was asset expired and required an increasing number of man hours to operate and maintain the plant to keep the discharge within the action limits of the site. Working with their R&D department, the Seven Trent Water Asset Creation team reviewed the company's Rural Treatment Strategy and sought out opportunities to upgrade the works with a low TOTEX and low carbon solution. Severn Trent Water chose the Phragmifiltre® system as it offered the best solution for a cost effective and sustainable outcome for Hulland Ward.

### Overview

The project consists of:

- Construction of a brand new process by the creation of both primary and secondary treatment reed beds.
- A new inlet pumping station comprising of a 7m<sup>3</sup> wet well.
- A new MCC to control reed bed feed pumping station, storm over-flow and returns.
- 3 (No.) primary reed beds (the first of their kind in the UK) and level control chambers.
- A flow control siphon chamber.
- 2 (No.) secondary reed beds and level control chambers.
- MCerts flow measurement chamber.
- Washwater pumping station.

MWH Treatment began work in August 2014 to replace the existing works consisting of two process streams which are hydraulically and biologically imbalanced, each comprising of a manually raked screen, a square pyramidal primary settlement tank and biological filter before effluent converges to a single humus tank.

### Introducing a new process to meet the demands of all stakeholders

A couple of years ago Severn Trent Water's Research and Development team began looking at the Phragmifiltre® system, which is a relatively new type of reed bed technology brought to the UK by French company, Epur Nature. The Phragmifiltre® consists of a vertical flow reed bed or constructed wetland that has been successfully used as both a primary and secondary treatment system throughout rural communities in France since the 1990s.

Severn Trent Water approached MWH Treatment to construct the new works, who embraced the new technology and ideas. Together, Severn Trent Water and MWH Treatment visited various sites in France to review the installations to assist in developing a detailed solution that would bring Phragmifiltre® to the UK.

This is the first time that a leading water company in the UK has commissioned the installation of a constructed wetland as a full treatment facility at a sewage works and is a major step-change in thinking and indicates recognition of the TOTEX benefits.



The first primary reed bed distribution pipework being installed  
Courtesy of MWH Treatment



The base completed secondary reed beds can be seen in the distance with the 1960s conventional treatment works at the front - Courtesy MWH



Excavators are used to lay the sand on top of the gravel  
Courtesy of MWH Treatment



ARM employees rake the sand on to the base of the reed primary beds 1 & 2 - Courtesy of MWH Treatment



A layer of fine sand constitutes part of Phragmifiltre® construction  
Courtesy of MWH Treatment

### Engineering a solution - sharing knowledge and expertise

Using knowledge from across the global business MWH Treatment embraced Severn Trent's proposal and worked with ARM Ltd and Epur Nature.

The systems are designed to have two stages. The first stage is batch fed and treats raw, unsettled primary wastewater on the surface of the bed, primarily reducing BOD and gross solids. The filtrate then passes down through the reed bed and is collected within a siphon chamber before being batch fed in smaller quantities to the secondary phase which is similar to a typical vertical flow reed bed, to further reduce BOD but primarily undertaking nitrification of ammonia.

At Hulland Ward there are 3 (No.) primary reed beds and 2 (No.) secondary reed beds. Wastewater is fed to each bed in rotation based upon a predetermined cycle. This cycle allows each of the primary beds to have a 'rest' period whereby anaerobic digestion takes place. The use, where possible, of siphon technology for dosing both stages minimises, or even eliminates, power requirements.

### Developing a solution

In the past constructed wetlands have generally been used as tertiary treatment to polish effluent prior to discharge. Phragmifiltre® has added a new dimension to constructed wetland technology and Severn Trent Water is once again leading the way when it comes to harnessing the benefits of natural wastewater treatment systems.

The design was taken forward to contract and ARM was engaged by MWH Treatment to construct the internal elements of the Phragmifiltre® under the guidance of Epur Nature.

### Challenges

The Hulland Ward site has thrown up some challenges, mainly because parts of the existing works and structures have to be retained until the first reed beds are complete and commissioned before the existing works can be de-commissioned and the remaining reed beds constructed.

The primary reed beds have a large footprint and, to facilitate the final stages of the build, the old primary tanks and part of the old inlet works needs to be de-commissioned in order to provide enough space to complete the third and final primary reed bed.

The geology of the existing land meant further design challenges had to be embraced, so MWH Treatment drew on the expertise of MWH ETS. This involved specialist geotechnical engineers assisting in the production of the final solution. The site also has a maternal roost of bats, consisting of some 36 mammals, together with nesting birds and great crested newts within a close proximity.

### Lasting memory for the community

There are CAPEX and TOTEX advantages to installing a Phragmifiltre® system. Conventional sewage treatment works generate sludges that have to be removed from small rural works to larger facilities for treatment, but as Phragmifiltre® does not generate sludges on a daily, weekly or yearly basis, the reed beds or wetlands only need to be cleared on 10 yearly cycles, therefore eliminating regular tanker requirements. With very few maintainable parts, the reed beds have a very low operational demand.

The site will be an ultra-low carbon and low maintenance solution which effectively meets discharge consent and lends itself to a wide diversification of habitats.

*The editor and publishers would like to thank Mark Slatcher, Project Manger with MWH Treatment, Adrian Woods, Site Manager with MWH Treatment, and Dan Cuncliffe, Programme Manager with Severn Trent Water, for providing the above article for publication.*

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