

# Five Fords WwTW, Wrexham, N. Wales

## whole catchment solutions challenge the norm

by  
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**F**ive Fords Wastewater Treatment Works (WwTW), near Wrexham, is one of the principal wastewater treatment works in North Wales, serving a population of 96,000. To ensure compliance, Dwr Cymru Welsh Water took an innovative approach. The £3.5 million scheme was founded on a catchment based approach to achieving the best environmental result by combining provision of works improvements, storm storage and a parent Combined Sewerage Overflow (CSO) on the site.

The improvements formed part of Dwr Cymru Welsh Water's strategy to achieve 100% compliance with consent standards across the asset base. The AMP3 investment Programme included funding for improvements to CSOs within the catchment and the parent CSO at the works.

The scheme was delivered by *Meica Process, Galliford Try Northern, EC Harris and United Utilities Operational Services as members of the Welsh Water Capital Alliance*. The Capital Alliance is a strategic partnering team made up of specialist engineering, construction and cost management companies, which was formed to deliver around 60% of the water company's Capital Investment Programme during the AMP3 period.

Hydraulic Modelling was carried out to address the spill frequency issues in the catchment and to identify storm water requirements at the works. The Modelling also identified that the existing treatment works had limitations restricting the flow to full treatment resulting in potential for premature discharge of storm water.

Although not funded in the AMP3 programme, Dwr Cymru Welsh Water approved a significant works improvement scheme which was integrated with the parent CSO and storm storage improvements at the works.

The team agreed with the Environment Agency that these improvements combined with a degree of additional storm storage would provide the required receiving water quality improvement.

### Joint monitoring

Following the improvement works, the water company and the Environment Agency, jointly monitored the receiving water quality and reviewed performance after a period of 12 months. Dwr Cymru Welsh Water agreed that they would implement further improvements if the required environmental standards were not achieved.

### The resulting works included:

- \* increasing operational capacity of the works (FFT) from 600 l/s to 806 l/s;
- \* provision of fine screening for all sewage flows arriving at the works;
- \* provision of additional storm storage and improved operation of the existing facilities;
- \* in conjunction with the Environment Agency to monitor works performance and environmental quality of receiving waters (Clywedog and Dee) for a period of 12 months;
- \* review works performance and identify further improvements if required.

Design flow conditions at the works were as follows			
Description	Flow		Previous consent condition
	m <sup>3</sup> /d	l/s	
DWF	27721	321	
FFT	69608	806	1063
Form A	163738	1895	
Max Flow		2600	

This shows that required flow conditions were significantly lower than the previous consent conditions allowed. It is assumed that previous growth estimates for the area were not realised. The scheme therefore proposed that the consented Flow to Full Treatment (FFT) was modified from 1063 to 806 l/s

Previously Hydraulic and Performance restrictions only allowed sewage flows up to approx 600 l/s to receive full treatment.

Following investigation of the hydraulic and performance limitations and approval to improve the Five Fords WwTW, it was agreed that further SPIRIT analysis should be carried out.

Accordingly, an existing hydroworks model was updated and a series of SPIRIT analyses carried out for a range of flow conditions and storm storage volumes.

If storm storage volume was determined based on 2 hours of FFT then a volume of 5800m<sup>3</sup> would be required. Similarly, if a basis of 68 l per capita is used then the required volume would be 6300m<sup>3</sup>. If the existing storage volume were effectively utilised then 4886m<sup>3</sup> was already available. Therefore, on this basis, the volume of additional storm water storage required ranged from 914 to 1414m<sup>3</sup>.

If we consider SPIRIT analysis then the 'storage requirements' graph shows the relationship between FFT and additional storm storage required in order to reduce the annual spill duration to less than 1%. This showed that for an FFT of 806 l/s an additional storm storage volume of 2600m<sup>3</sup> would be required.

Taking these factors into consideration, it was agreed that the best environmental solution for this works would be to increase the flow to full treatment since final effluent is discharged direct to the Dee and storm discharges to the Clywedog (small tributary).

Chart 1 shows that increasing FFT to 806 l/s and an additional 1000m<sup>3</sup> of storm storage will result in an annual spill duration of approx 1.2%. Taking account of the significant improvements to wastewater treatment it was agreed that 1000m<sup>3</sup> of additional storm storage capacity should be included as a first stage. This volume is consistent with the requirement for 2 hours at FFT.

Following these improvements the environmental performance of this works was jointly monitored by Dwr Cymru Welsh Water and Environment Agency for a period of 12 months before further review. the scheme was proven to have achieved the environmental requirements and **no further work was deemed necessary.**

The scheme included construction of a new inlet works including storm screens, CSO, fine screens, screening handling and flow control facilities. Storm water was separated and transferred to the existing storm tanks and new storm tanks before discharge to the Clywedog or returned to the inlet works. Optimisation of the existing primary settlement tanks included the installation of new scrapers and automatic pumped desludging. Optimisation of the existing filter works includes hydraulic improvements, new distributors, media turn over, direct recirculation, an additional humus tank, new scrapers and auto desludging. Improvements to existing aeration plant included hydraulic modifications, improved distribution, new scrapers, increased RAS pumping and auto desludging.

Conservation issues at this works were sensitive and included the presence of newts and other wildlife activity. Appropriate measures were incorporated in the scheme including organising a newt licence. ■

**Note:** *The author, Colin McCabe is Programme Manager with the Welsh Water Capital Alliance's North Wales Team. The Capital Alliance is Dwr Cymru Welsh Water's strategic partnering team delivering the majority of its Capital Investment programme.*

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