ENVIRONMENTAL FLOOD RISK DRAINAGE ECOLOGY

Tame Model Combination

Severn Trent, Asset Delivery, 2007-09

Project aims

A fit for purpose hydraulic sewer model was required to provide hydraulic outputs to feed into the water quality modelling used to determine AMP4 UID storage volumes in the Tame catchment.

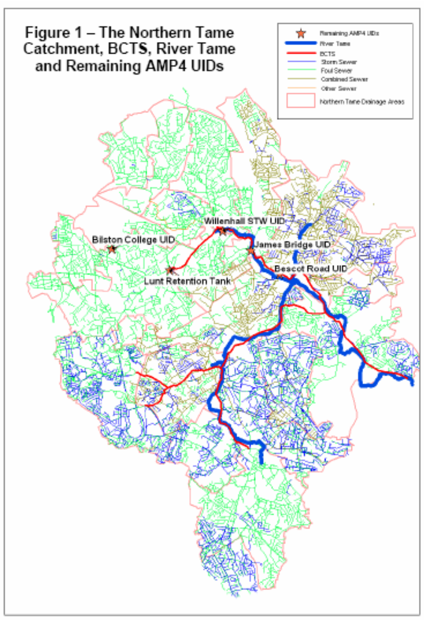

Figure 1 – The Northern Tame Catchment, BCTS, River Tame and Remaining AMP4 UIDs

It was necessary to develop a robust methodology to allow a large number of individual DAP sewer models to be combined to form a large single model of the Black Country Trunk Sewer.

The methodology had to demonstrate that the original verification status of the individual models was not compromised, yet the predictions at the CSOs along the BCTS were accurate to allow solution design.

Project summary

The Northern Tame catchment covers nearly 149km^2 and consists of a number of individual drainage areas linked by the BCTS. The total population of this area is nearly 600,000. Individual AMP3 or AMP4 DAP sewer models were available for each drainage area, though these generally terminated at the outfall to the BCTS. Surcharge within the BCTS extends back into many of the individual contributing catchments, and affects CSO performance. As a result, there was a need to link all the individual catchment models and the BCTS to produce a single Northern Tame model, allowing all aspects of system performance to be represented.

Figure 4 – CSO at Willenhall STW Previously Un-modelled in DAP.

Combining different models is not a simple or straightforward process. Different models will have a number of default and specified parameter conflicts, which can result in model performance being significantly changed if two models are simply added into the same model space. As a result, a robust process was necessary to ensure that no errors were introduced during the combination process. It was also necessary to develop a checking process to identify any changes in base performance of the models during the model combination process.

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The Northern Tame catchment was split into 21 smaller drainage areas, represented by 13 individual models. The format of the models differed significantly, as they we constructed by different consultants, or to different specifications (in AMP3 and AMP4).

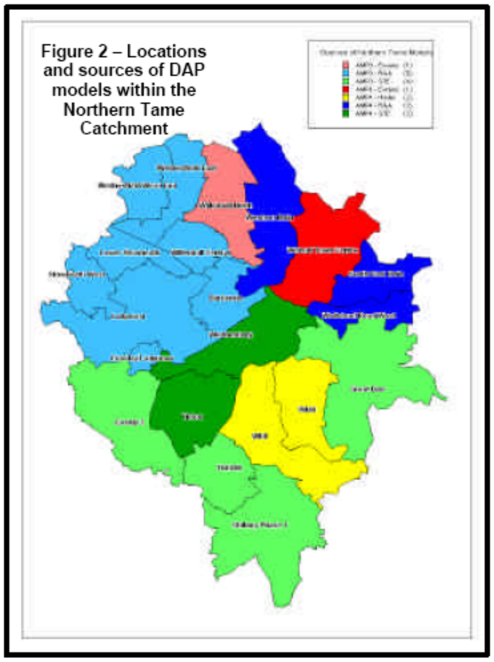

Figure 2 – Locations and sources of DAP models within the Northern Tame Catchment

Verified models were collected for each area, and a model of the interlinking BCTS was also constructed. A long term flow survey of 26 flow monitors was then installed along the BCTS to allow verification of the trunk sewer flows, which had previously never been verified as the individual models all terminated at the outfall to the BCTS. Surveys of the key ancillaries on the BCTS (such as Willenhall CSO and WwTW were surveyed and included in the BCTS model).

Some of the models had been constructed at the start of AMP3, and thus before combination, there was a need to undertake a degree of model maintenance. These models were updated with 93 schemes and 83 recent development sites.

Prior to the models been combined a detailed review of all potential conflicting parameters across each of the models was undertaken. This included land use indices, runoff surface parameters, wastewater and trade waste profiles, land use profiles and default parameters.

Default parameters were frozen within each individual model by changing the flag, so as to prevent the default parameters changing when all the models were combined.

A complex matrix was established allowing each wastewater, trade, landuse and runoff surface index to be renamed within each model, so that no conflicts existed. The index names were changed to contain a catchment specific reference so that auditability was maintained.

Any overlaps or duplication points between the individual models were then identified and removed or amended as necessary. Likewise, any connection points between the models were prepared so that the models could be connected upon combination.

The models were then copied into a single model space and joined together where necessary. Simulations against a standard storm were undertaken at a number of stages to ensure that model performance was not changed or compromised through each of the key steps (e.g. parameter referencing and combining of models). This added comfort that the verification status of the model was not compromised due to any errors being introduced during the combination process.

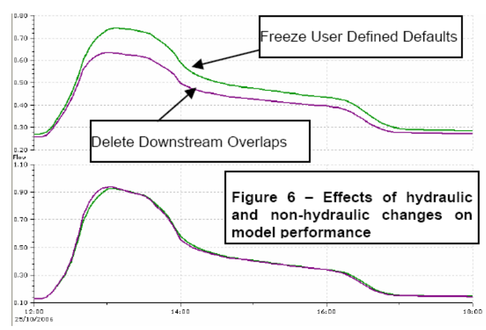

Figure 6 – Effects of hydraulic and non-hydraulic changes on model performance

Finally, the verification status of the BCTS was checked against the data from the long term flow survey.