



ENVIRONMENTAL



FLOOD RISK



DRAINAGE



ECOLOGY

# Derby DAPs & Solution Design

Severn Trent Water, 2004 to 2009



## Project aims

Model build and verification for south-west Derby areas. Combine model with central and north-east Derby models built by others. Model testing and sensitivity analyses. Report on catchment Needs and Drainage Area Plan. Undertake model analysis and develop outline solutions for flooding drivers and unsatisfactory CSO performance.

Key aspects of this study involved InfoWorks model build and verification, model combination, CSO and flooding investigation, UPM river impact assessment, Type III model upgrade and outline solution design, both local and strategic.

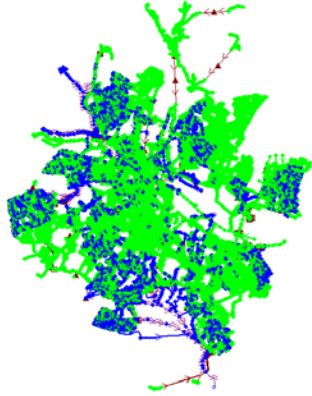
## Project summary

An InfoWorks hydraulic model was built and verified against 52 flow monitors representing South West Derby. The model was verified using the New UK

Runoff model to represent the observed slow response flows.

The InfoWorks model was subsequently combined with two other models that represented the central and northern catchments. The combined model, covering the 255,000 population of Derby, contained some 15,300 nodes. The model also included a representation of the watercourses within the catchment, which in a number of places interact with the combined sewer system. Rural hydrology models were used to represent the flows in minor watercourses, and river level data was used to represent the interaction between sewer outfalls and the River Derwent.

The catchment was the subject of a major flooding relief scheme design. A thorough understanding of the complex trunk sewer interactions and catchment runoff processes was required to verify the model and to inform the development of scheme options.



The flooding scheme included major attenuation storage, and ultimately the construction of a new CSO. Replicating the system responses to fast and slow catchment run-off was critical to predicting storage volumes and CSO spill regime.

Due to size and importance of the proposed scheme and the complexity of the catchment, a series of sensitivity analyses were undertaken to assess the robustness of the scheme options.

The impact of the solution on the STW performance and major ancillary performance was also investigated.

The outputs from the model were used in a river impact analysis to assess the impact of the new CSO

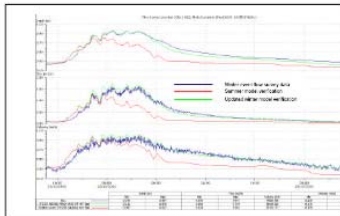


Figure 5 Phase 2 Winter /Summer Verification

on the performance of the local receiving water. It was necessary to demonstrate no deterioration in

performance to the EA. This UPM analysis was undertaken against FIS and RE criteria, for a variety of seasonal conditions, due to the sensitivity of the model performance to seasonal slow response flows.

On completion of the solution modelling, the structural, operational and hydraulic Needs of the system were assessed as part of the DAP.

The model was then used by Clear in 2007 to assess the performance of the screens of a large pumped CSO. Various new screening solutions and large scale strategic solutions were investigated to resolve this issue.

Many of the investigations undertaken as part of the Derby hydraulic modelling assessment were used to provide data for the development of the Severn Trent AMP4 and AMP5 modelling specification, particularly those issues relating to runoff modelling, antecedent conditions and seasonal variation in slow response.



In 2009, the model was upgraded to Type III standard at a number of more local flooding locations. This involved further detailed flow, manhole and impermeable surveys to increase model confidence in these scheme areas. Detailed drainage surveys were undertaken to identify all low spots, and localised overland flow modelling undertaken in IWCS 2D to demonstrate the surface transfer of floodwater flows.

