



Borough of Erewash

LONG EATON CASE STUDY

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INTRODUCTION

Erewash Borough Council were commissioned by Severn-Trent Water (Eastern Division) to undertake a Drainage Area Study for the town of Long Eaton, which is situated eight miles west of the City of Nottingham.

The objectives of the study were to investigate and quantify the structural and hydraulic performance of the strategic sewer system within the catchment and to formulate an Action Plan for the implementation of remedial works.

This paper highlights the critical factors which had to be taken into account during the hydraulic analysis undertaken as part of the study.

STUDY AREA

The town of Long Eaton, which formed the study area, covers 863 hectares and has a population of 35,000. The area has a flat topography and is low lying within the Trent Valley basin. Ground conditions in the area mainly comprise sands and gravels; groundwater levels fluctuate between 0.6m and 10m below ground level due to both seasonal and tidal effects related to the River Trent.

The strategic system is predominantly separate with a few isolated combined areas in the older parts of the town. The foul/combined catchment is served by four distinct sewers discharging to the Toton Water Reclamation Works and the surface water catchment by several independent systems discharging to water-courses.

Due to very shallow gradients present in the foul/combined system, silt deposition is a major problem with up to 30% siltation in some parts.

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HYDRAULIC ANALYSIS

A single hydraulic model was formulated for the foul/combined system and several smaller models for the surface water systems. The models were based on the strategic sewer network but extended into areas where known hydraulic deficiencies existed.

The smaller surface water systems were relatively straightforward to model. However, the foul/combined system was more complex - 35 km were modelled from a total length of 97 km of foul/combined sewers within the catchment. In order to accommodate the model on the micro the lengths to be modelled were further simplified by combining pipes of the same size and similar gradient. The final model incorporated 220 No pipe lengths, 3 No syphons, 8 No on-line tanks, 3 No pumping stations and 1 No subsidiary surface water system.

The critical factors influencing the performance of the model and the verification process were:-

- (a) loss of bore due to siltation
- (b) roughness coefficient due to siltation
- (c) assessment of base flows for start of storm
- (d) overflow discharge coefficients
- (e) initial water levels in pumping stations at start of storm
- (f) storage in system.

After taking into account the above factors, the models confirmed the known performance of the strategic system with known flooding and extensive surcharging being predicted. 85% of the monitored results were within the tolerances laid down. Some difficulties were experienced with silt affecting velocity monitoring during verification.

Due to the extensive siltation present two models were formulated; the first for the present silted condition and the second for a clean de-silted condition, and these were used to assess the implications of future development and the extent of remedial works in the Action Plan.

CONCLUSION

Experience has shown that a number of factors must be considered during the modelling process and the consequences of overlooking some can have a dramatic impact on the hydraulic analysis.

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The Long Eaton Case Study : M. Farley & G. Webb, Borough of Erewash.

A. Stevens : When simulating the siltation, did you alter just the roughness or both roughness and diameter ?

Answer : Various combinations were tried, but no major effect on results was observed.

N. Simmons : How did you know there was no spatial variation in rainfall if you only had one rain-gauge ?

Answer : The verification fits indicated that the assumption of uniform rainfall was valid.

D. Salih : Hertsmere : What effect did the silt have at the on-line ancillaries ?

Answer : Fortunately, there was no silt in the vicinity.

D. Walters : Bolton MRC : The measured hydrographs didn't appear to show the characteristic shape associated with a P.S.

Answer : The monitor was some way downstream, and also the P.S drained combined areas and therefore was operating continually.

Question : Where were the loggers actually fixed in the silted sewers ?

Answer : They were offset to prevent them being covered by silt.
