

## WATER QUALITY MODELLING WITH WASSP

Robert J. Henderson

River Basin Management Group  
WRc Engineering  
Swindon.  
Tel. 0793 488301

Introduction.

A major programme of research is in progress to provide the techniques necessary to allow the problem of storm sewer overflow (SSO) discharge consent setting to be addressed in an integrated and objective manner. The River Basin Management programme, coordinated by WRc Engineering, draws upon the expertise within Water Authorities, the 3 WRc laboratories, academic institutions and research organisations. It aims, in the short term, to produce:

- a quality sub-model for the WASSP-SIM program,
- a simple river impact model,
- time series rainfall inputs,
- an extended river quality classification system which takes account of the transient effect of overflow discharge.

These will enable

- i) the quality variations in SSO spill to be calculated in terms of critical pollutants on an annual basis or for individual storm events,
- ii) the impact on the receiving stream to be identified taking account of the capacity of the watercourse to accept pollution,
- iii) the conditions generated in the river by transient inputs to be related to the Environmental Quality Objective (EQO) of the river.

Development of the quality sub-model.

Work towards the development of the model is now underway and is anticipated to be completed within 3 years. Hydraulics Research Ltd (funded by the DoE) are to develop the software for a model based on concepts formulated jointly by WRc and HR. The necessary fundamental research is being undertaken by WRc and Manchester University funded jointly by SERC and WRc. NWWA are also part-financing the projects, providing analytical services and making available the sites for the collection of data to construct, calibrate and verify the models.

Catchment studies.

The quantity and quality of flows is being monitored in at least four sewered catchments in the North West (by Manchester University) and in one catchment in the AWA region (by WRc). Useful data exist for two other locations and further sites are being sought in other Authority areas. The sites have been chosen to give a representative range of catchment types (sizes, slopes, land uses/industries etc) as well as a range of overflow constructions and receiving stream types. Automatic flow samplers triggered by flow conditions and controlled by microprocessors are used to take discrete samples at short time intervals under all flow conditions including overflow. Samples are analysed for the determinands of principal importance in the context of short term impacts, which are considered to be COD, BOD, suspended solids, total dissolved

solids and ammonia. WASSP-SIM models have been constructed to provide the necessary quantitative information against which to consider the qualitative response of these catchments.

#### Sediments in sewer systems.

The deposition and subsequent washing out of sediments in sewer systems is considered to be a major factor relating to the quality of SSO discharges. An investigation to establish the scale and nature of sediment deposition in sewers is currently in hand, managed by CIRIA. Later phases of this study will be directed towards filling gaps in the knowledge with respect to sediment behaviour so that the necessary effects can be incorporated into models. A number of research projects into the mechanisms of sediment transport, deposition and subsequent re-entrainment within sewers may be undertaken by academic institutions and funded by SERC. The CIRIA study should confirm the need for these projects and enable detailed objectives to be defined.

#### Processes to be modelled.

The processes identified as being of importance to the characteristics of combined sewage flows are the build-up of aerial and surface pollutants; the washoff of these pollutants; the effects of gully pots; the nature of the foul or base flow components and the effects of in-system sediment deposition, degradation and re-entrainment. It is envisaged that the model will include mechanisms for considering all of these factors.

#### Conclusion.

The programme of work which has been briefly outlined has been formulated in response to an identified need of the UK Water Industry. The work currently in hand relates to a three to four year programme which is just commencing and will satisfy the immediate requirement for objective methodologies for upgrading sewer systems which currently cause pollution of adjacent watercourses. A key product of the research will be a quality modelling capability for WASSP.

An interim procedure is being developed for inclusion in the update of the Sewerage Rehabilitation Manual to be published in April 1986. This will be a step in the right direction but will necessarily embody some simplifications and retain a degree of subjectivity. It will, however, represent a significant advance on present practice.