

WAPUG SPRING MEETINGS 1990

Glasgow - Tuesday 24 April 1990

Hertsmere - Friday 27 April 1990

DEVELOPMENT OF MOSQUITO

BY

J T SIMM - NORTH WEST WATER

INTRODUCTION

In the first part of the presentation I will give an outline of the MOSQUITO package, and the management framework within which it is being developed. Andy Baldwin from Hydraulics Research (HR) in the second half of the session, will give more technical details of the model itself and the testing programme which HR and WRc carried out.

My presentation will cover four areas:-

1. What the model does and how it is built up
2. The management of the project
3. The testing programme used to validate the model for future development of the model
- 4) Future development of the model

THE MOSQUITO MODEL

MOSQUITO is an acronym for Modelling Of Stormwater Quality Including Tanks and Overflows; and the package is a computer programme for the analysis of the polluting load discharged by sewerage systems. It simulates sediments and pollutants in combined or separate systems for different storm event loadings, and produces discharge pollutographs for SS, BOD, COD, NH3.

MOSQUITO comprises four sub-models:-

- * Wash-off from catchment surfaces
- * Foul sewage inflow
- * Pollutant behaviour in pipes
- * Pollutant behaviour in ancillary structures.

It is linked to the WALLRUS package for flow simulation, which carries out all hydraulic calculations used by MOSQUITO. Inflow data for each sub-model is based on UK catchments.

MANAGEMENT OF THE PROJECT

The development of MOSQUITO is funded by the Department of the Environment (DoE) through a grant to HR. The package has been jointly developed by HR and WRc, under an Agreement dated May 1987. HR's expertise lies in software development, flow and sediments, marketing and software support; whilst WRc's expertise lies in standards, performance criteria and in-river processes. The working arrangement is that HR are responsible for model building and calibration; with WRc being responsible for the requirement specification, field data collection and model evaluation and testing. Overall management of the project is undertaken by the River Basin Management Group (RBMG).

The Group felt that it would assist the finalisation of MOSQUITO, particularly in respect of the testing programme to validate the model, if a separate MOSQUITO Working Group (MWG) was established to co-ordinate this work.

It also considered that the MWG should primarily be utility led, and accordingly the Group was set up in January 1990, to co-ordinate and oversee the testing programme. The Group is Chaired by Andy Eadon of Severn Trent Water and I am its Technical Secretary; the other members of the Group are Martin Osborne of HR and Ian Clifforde of WRc. Additional members are co-opted from time to time to deal with specific issues as they arise. The terms of reference for the Group are:-

- (a) Reassure the RBMG that the MOSQUITO Model is adequate for use in the Sewerage Management Planning (SMP) Club Contract Pilot Studies.
- (b) Prepare a report to demonstrate the above, based on evidence from the use of the model in practical situations, to an acceptable level of accuracy.

TESTING PROGRAMME

The testing programme was set up and this had to be completed by the end of March, in accordance with the timetable set by RBMG. The programme was divided into two concurrent series of tests, Team A led by Chris Hutchings (WRc), began mass balance tests using theoretical data, building up from simple catchments and flow regimes to more complex ones. This team then tested a catchment in Preston, which was a simple network containing only one SSO, using archive data. Team B led by Andy Baldwin (HR), began by testing the Clayton catchment in Hyndburn BC, which again is a small network containing a single storage type SSO. This team then tested the Higham Ferrers Catchment, which is a more complex one containing three SSOs.

The detailed results of the tests will be discussed by Andy Baldwin in the second half of this presentation. The main conclusion however is that the model still has unacceptable mass balance errors. This problem will be addressed in the next few months, before MOSQUITO can be used on the SMP pilot studies.

FUTURE DEVELOPMENT OF THE MODEL

DoE have provided funding to HR for a further two years until April 1992, to develop MOSQITO-2, and again this work will be managed by RBMG. The MWG have recommended to RBMG that it continues in existence to oversee this work, as its input proved very effective in overseeing the testing programme for MOSQITO-1. WRC has produced a draft specification for MOSQITO-2 which was considered by the Group. After discussion, the Group are recommending to RBMG that MOSQITO-2 should concentrate on improvements in the following areas:-

- * Improved calibration
- * Sediment behaviour in ancillary structures
- * Bacterial indicator species
- * Hydrogen sulphide generation

The development work for MOSQITO-2 is relying heavily on fundamental research undertaken during the development of MOSQITO-1. It is therefore essential that if the model is to be further developed into MOSQITO-3, then the fundamental research for this development must be undertaken between now and 1992. The MWG has recommended to RBMG that four areas of fundamental research be undertaken over the next two years. The suggested programme comprises:-

- (i) Sources of sediments and pollutants
- (ii) Sediment and pollutant transport and deposition
- (iii) Behaviour of sediment deposits in pipes
- (iv) Performance of ancillary structures

The research required in Area (ii) has been defined, and will be undertaken by HR, with funding from DoE and the Industry. The requirements in Area (iii) are defined in WRC report FRO040, and SERC funding would seem appropriate for this part of the programme. The remaining two Areas need to be considered in the near future, for discussion with potential funders early in the current financial year.

JTS/KJL

19 April 1990

MOSQUITO PROGRESS - T SIMM (NWW LTD) / A BALDWIN (HRL)
A R EADON (STW LTD) / C HUTCHINSON (WRC)

R Chaplin - York

Are the results presented purely from MOSQUITO or from site?

A Baldwin - HRL

Most of the results in the paper were from MOSQUITO but 2 out of 3 showed good correlation.

R Marshall - Sheffield City Polytechnic

How long will it be before a full analysis of river pollution can be predicted?

M Osborne - HRL

Five pilot studies have been set up to run for 2 years. Four topics will be assessed, the results of which should be ready within one year:

- Time series model
- Urban model
- River impact model
- Permissible effluent discharge standards.

R Ambrosen - Wessex Water

When will MOSQUITO be available?

M Osborne - HRL

We are currently alpha-testing, expected to test another 2-3 months. We intend to carry out long beta-testing of approximately 1 year duration in a group of pilot studies. Expect final release in approximately 2 years' time

S Spackman - Dobbie & Partners

There seems to be an emphasis on sediment characteristics. How are these determined?

C Hutchinson - WRC

Sediment will have to be tested in a laboratory for physical characteristics such as particle size distribution and density. Essentially two sets of characteristics will appear in the model, the default parameters and over-riding local data.

D Wright - Applied Research

You have only mentioned sediments - what about dissolved pollutants? Is there more pollutant load in the sediment or dissolved?

C Hutchinson - WRC

Based on samples, there is generally more pollutant load in the sediment.

M Osborne - HRL

The actual pollution load on the watercourse will depend on how much sediment is retained by the SSO. An SSO can have no effect on dissolved pollutants.