

THESIS

**DEVELOPMENT OF HYDRODYNAMIC MODEL FOR FLOOD
ROUTING OF RAVI RIVER
(BALLOKI TO SIDHNAI REACH)**

submitted by:

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(97-PG-WRE-02)

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For the Degree of

MASTER OF SCIENCE

IN

WATER RESOURCES ENGINEERING

CENTRE OF EXCELLENCE IN WATER RESOURCES ENGINEERING

UNIVERSITY OF ENGINEERING AND TECHNOLOGY

LAHORE, PAKISTAN

2000

ABSTRACT

This study was carried out to develop a one-dimensional hydrodynamic model of Ravi River. The model was calibrated and validated for the Balloki to Sidhnai reach.

The flow in a natural channel is unsteady during floods. It is described by Saint Venant's equations. These equations are based on certain assumptions regarding flow conditions. However these assumptions do not effect the flow behaviour appreciably. Saint Venant Equations are hyperbolic partial differential equations and their solution is only possible by numerical methods. There are different types of numerical schemes. For this study the Preissmann scheme was used. The system of equations obtained from this scheme is solved by Newton Raphson iterative method.

The hydrodynamic model developed in this study was calibrated for the year 1992 flood. Inflow hydrograph at Balloki barrage from 9-9-1992 to 19-9-1992 was used as upstream boundary condition. Actual river cross-sections for the flood of year 1992 were used. The observed and the computed hydrograph were in close agreement with each other. The percentage error for peak discharge for the observed and computed hydrographs at Sidhnai was 1.7%.

The model was then validated for the flood event of year 1995. The cross-sections of year 1992 were applied. Inflow hydrograph at Balloki barrage for the period

5-9-1995 to 16-9-1995 was used as upstream boundary condition. The percentage error for peak discharge for the observed and computed hydrographs at Sidhnai was 3.2%.

The sensitivity analysis of the model was also carried out. The model converged only for Manning's n value between 0.021 and 0.03. Within this range of values the variation of peak discharge was around 5 percent. For n value greater than 0.03 the model diverged and was sensitive to value of n .

For better understanding of the computations of the hydrodynamic model, a sample problem is given in appendix D. The source code, data input sample and the topographic data are given in appendices A, B and C.

Lastly, the developed model was compared with HEC-2 model. Discharge rating curves were drawn for both the models at Balloki and Sidhnai, for the year 1992 and 1995. The rating curves are very close to each other. The variation in water levels at different discharge values was not more than 0.2m.

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