

THESIS

**HYDRAULIC AND DRAINAGE EVALUATION OF
HASRI/WAHNDO BRANCH DEG NALA**



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BY

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ABSTRACT

Drainage may be defined as the removal and disposal of excess water from agriculture area. The basic sources of excess water are precipitation, irrigation return flow and seepage from channels. Surface drainage is timely and orderly removal of excess water from the surface of the land through shaping of land surface and through the improved natural channels or by constructing ditches. It includes both surface and subsurface drainage.

Natural drainage refers the condition when large quantities of excess water from the soil profile or the field surface are removed from the area naturally without any human interventions. The natural drains existing in upper part of Rechna doab includes (a) Aik Nala, (b) Deg Nala, (c) Nala Palkhu and (d) Nala Wagh. These drains carry the excess rainfall runoff and often attain the flood condition in monsoon season. Deg Nala is the mother drain in Rachna Doab. The total catchment area covered by Deg Nala and its tributaries is about 1887 square mile. The Hasri drain flows parallel to Deg Nala and lies in District Sialkot and District Gujranwala. The drainage area of Hasri Nala is about 437 square mile. The Hasri/Wahndo branch Deg Nala attained the flood condition and one of the bridges on Hasri nala at 514+000 RD of High way road and 34+000 RD of Hasri nala, was damaged near Wahndo during monsoon season 2011. The objectives of this study were to determine the peak discharge of Hasri/Wahndo branch Deg nala occurring in 2011 by using HEC-RAS inverse modeling approach and determine drainage coefficient of the area by using empirical method, curve number method, and computer based hydrologic model (HEC-HMS).

This study consists of hydraulic and drainage evaluation of Hasri/Wahndo branch Deg Nala on the basis of field and department data. The Hasri/Wahndo branch Deg Nala lies in "Rachna Doab". Data was collected from field by physical survey having drain attributes such that drain cross-section, slope, crop sown, cropping pattern and past flood marks. The drain design characteristics and catchment characteristics data was collected from Irrigation Department Gujranwala and Sialkot. The collected information was used as inputs in computer based hydrological models. HEC-RAS model was used for water surface profile at different discharges. By inverse modeling the peak discharge was estimated. Further curve number method coupled with dimensionless unit hydrograph approach was used to generate the flow hydrograph. HEC-HMS model, with embedded drainage and runoff parameters was used to reproduce the observed runoff hydrograph.

The peak flow in field flow hydrograph was 27 cumec having runoff volume 7.9 Mm³. Peak flow of flood hydrograph generated by curve number method coupled with dimensionless unit hydrograph was 27.7 cumec having runoff volume 7.6 Mm³. Further field flow hydrograph was compared with flow hydrograph computed by hydrological model HEC-HMS to verify the runoff parameters. The peak flow estimated by HEC-HMS was 27.3 cumec having runoff volume 7.4 Mm³.

The peak discharge estimated by HEC-RAS inverse modeling approach is 27 cumec in 2011 monsoon flood. In un-gauged basins the unit hydrograph method (UH) gives realistically good results to find out the peak discharge and volume of flow. The Synthetic unit hydrograph peaking coefficient (C_p) of the area is 0.462 and flood coefficient (C_f) is 2.5. Curve number for the area is estimated as 70 for rice season. Return period of 2011 rainfall determined by Gumble method is nearly 5 years. Drainage coefficient of the area for 5 years frequency is 0.061 cmsec/sq. mile.