

ABSTRACT

Analysing High Intensity, Rainfall-Driven, River Flooding in Port Maria,
St. Mary, Jamaica

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This dissertation seeks to analyze the extreme hydrometeorological ‘cause and effect’ on the flooding situation in Port Maria using a combination of both technical and participatory measures (anecdotal data). Computerized hydrological modelling systems software (HEC-HMS) in tandem with its ArcGIS based preprocessor: HEC-GeoHMS, were both used to simulate the Outram River basin’s response to an intense rainfall event: November 23, 2006. In addition, potential future impacts are analysed by applying statistical methods to present and historical rainfall trends.

The input of a bridge in the Port Maria town centre; built for a 1 in 10 year return period flood; was analysed. Statistical downscaling of the November 23, 2006 24-hour rainfall using the US-based NRCS method allowed for the estimation of the incremental rainfall and the resulting peak discharge for the event when run through HEC-HMS. This output is then compared to a series of peak discharges for 5, 10, 50 and 100 year return period events generated from historical rainfall data using the Gumbel method.

The results have shown that the runoff ensuing from the November 23, 2006 event produced as much discharge as that of a 25 to 50 year event and as such the floorboard of the bridge may have been too low to accommodate the generated discharge. The flood discharge simulated is $160.6 \text{ m}^3/\text{s}$.

To test the validity of the results, simulated outputs were compared to discharge calculated using the Rational and Slope-Area methods. The resulting peak discharges are calculated as $198.5 \text{ m}^3/\text{s}$ and $709 \text{ m}^3/\text{s}$. Sensitivity analysis of the model is carried out using the Monte Carlo method to generate 100 Curve Numbers. The results have shown low sensitivity to changes in Curve Number and a Confidence level of 1.31 for the compared discharges from Curve number variation and simulation for the reach and junction above the flood zone.

Keywords: Anuradha Ann Maharaj; Gumbel method; Hydrologic Engineering Centre-Hydrologic Modelling System (HEC-HMS); riverine flooding. Port Maria, Jamaica.