STUDI ALTERNATIF PENGENDALIAN BANJIR SUNGAI TONDANO DI KOTA MANADO

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ABSTRACT

Tondano River, along with its tributary Tikal a River, is very potential to cause flood in Manado City. It is recorded that flood occurred three times during the recent decade, that is in 1996, 2000 and 2005 year. In order to overcome the flood occurrences, the controlling effort that can be applied soon in the field is required through short term flood control plan using structural measures. To ensure the effective controlling effort, the river’s most critical sections should be determined for construction priority purposes and the available alternative plans should be studied to define the best plan based on the hydraulic feasibility and their effects on the river uses.

The study is carried out through the 5 year return period flood routing using the version 3.1 HEC-RAS software. The 5 year flood hydrograph is obtained using Nakayasu Synthetic Unit Hydrograph by elaborating design rainfall derived from partially series rainfall data frequency analysis of Tondano and Tikala watersheds. Flow simulation is conducted in steps by modeling the Tikala River as the lateral inflow. The first simulation is carried out for existing condition through steady flow analysis using bankfull capacity discharge to define the flood characteristic and critical sections. The second simulation is carried out for 5 year return period flood through unsteady flow analysis on each flood control plan to study the hydraulic feasibility. The study conducted herein is elaborated on water surface profile and velocity due to the plans effectiveness to carry off the flood discharge safely as well as the effect on river uses.

Based on the existing condition simulation, result shows that the river’s most critical sections are the right bank of RS 44 (sta 2+799) to RS 46 (sta 2+953), the left bank of RS 72 (sta 4+492) to RS 73 (sta 4+515), and the left bank of RS 84 (sta 5+233) to RS 88 (sta 5+642) respectively. The result of flood control simulation indicates that there are no significant differences on velocity among plans, but there are disparities on the capacity to carry off flood discharge safely with no overtopping. For the normalization plan, the overtopping of 2.761 m in overall length is occurred and there is 1.150 m length of critical section, whereas both for dike plan and combination of dike and normalization plan, no overtopping are occurred but 783 m length of critical sections are still existed. Revised plans for dike and combination of dike and normalization are equally effective in carrying off flood discharge securely, but have different effects on water utilization during low flow period. At maximum tidal elevation of +2.50 m, backwater occurs to upstream as far as 3.514 m on dike plan compared to 4.847 m on combined dike and normalization plan, while the latter has more adverse effect on the fresh water supply due to sea water intrusion. Referring to the study result, the best alternative is revised dike plan.