HYDRAULIC MODEL OF STORMWATER DRAINAGE SYSTEM USING DIFFERENT METHODS FOR DEFINING THE CATCHMENT AREA

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Abstract The stormwater drainage system is an infrastructure facility that accumulates the rainwater, protecting the urban areas from flooding. An important parameter for these systems in urban areas is the size, shape and type of catchment area. According to current practice the catchment area can be determined by: classical methods- where the catchment area can be defined using a roof symmetry by links and modern methods in which the definition of the catchment area is made by the elevation differences, natural water barriers, slopes, etc. by using break lines and different characteristic catchment width. Subject of this hydraulic analysis is to apply the classical and modern methods in order to show their advantages and disadvantages with a further comparison and recommendations for designing the stormwater drainage system – using the rational method.

Keywords: stormwater, methods, analysis, catchment

Methods

For the purpose of the hydraulic analysis, a hydraulic model has been developed that will simulate the runoff conditions of the stormwater drainage system, using the SWMM (Storm Water Management Model) software package according to the two methods:

- Classical - the boundary conditions will be determined by the method of roof symmetry by links
- Modern - generating the topography of the terrain, with a main note on its: slope, groundwater, its use, elevation, geometric change, embankments, etc. (break lines) – using different runoff coefficient C

The return period from the inserted IDF-curves was chosen for 2 years to be in accordance with the designing law for stormwater drainage systems. The hydraulic model is made for the city of Ohrid, North Macedonia.

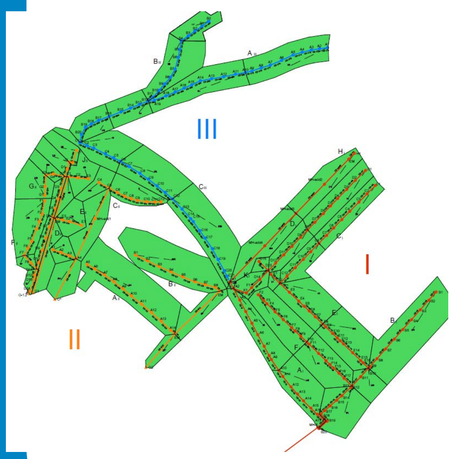

Figure 1: Classical method

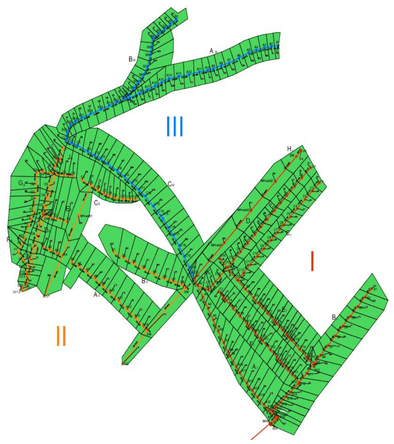

Figure 2: Modern method

Results

To make a comparison between the accuracy of the two analyses of the hydraulic model, one can see the difference in the flow rate of the links, depending on the amount of water they receive from the catchment area- using hydrograms (Q-T).

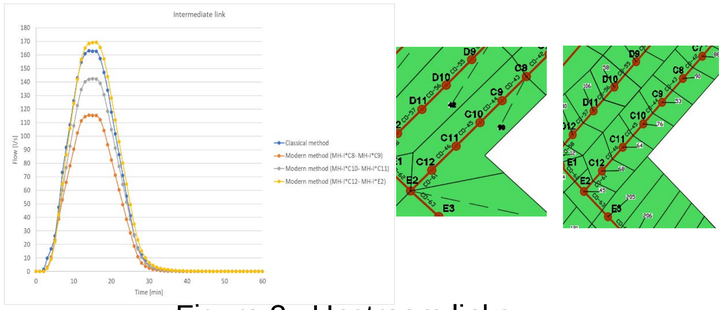

Figure 3 : Upstream links

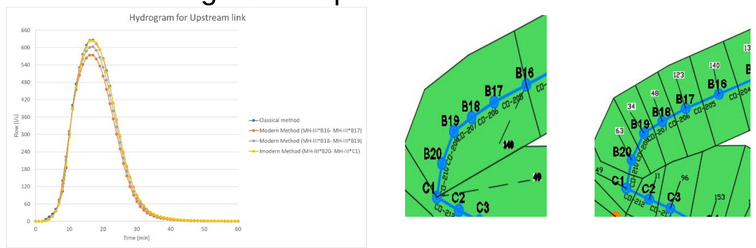

Figure 4 : Intermediate links

Figure 5 : Downstream links

Conclusions

When analyzing a stormwater system, the modern method it is said to be better for upstream parts because they allow optimization of the pipe diameters (due to its peak flows). With the help of diametric optimization, lower economic cost of current projects would be obtained. In the case of the intermediate and downstream parts of stormwater drainage systems, it can be said that both the classical and modern methods are suitable for the use of catchment area definitions, as the difference in hydrograms is minimal. These recommendations would apply to urban, predominantly plain areas.

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