

Stormwater control of new urban developments – Planning and modelling the Penalva system

L.M. David^{1*}, R.F. Carvalho^{2*}, R. Isidro³, M. Sobral³

¹ LNEC - National Laboratory for Civil Engineering, Av. do Brasil 101, 1700-066 Lisboa, Portugal

² IMAR-Institute of Marine Research – Marine and Environmental Research Centre, Dept of Civil Eng., R. Luís Reis Santos - Pólo II University of Coimbra, 3030-788 Coimbra, Portugal

³ Barreiro Municipality, Water and Sanitation Department, Rua dos Resistentes Antifascistas, Edifício TCB, 2830-523 Barreiro, Portugal

* Corresponding author, e-mail ldavid@lnec.pt

ABSTRACT

This paper presents a methodology for the integrated planning of urban development, overland flow and flood mitigation and control. The sewer network is sized for a 5-year return period, but the appropriate landscape reshaping and detention basins integrated in a green corridor ensure safe and controlled flows for storms with a 100-year return period. Design criteria and a detailed description of the modelling activities are presented and applied to a real case. The solution obtained is also able to deal with exceptional conditions, such as increased rainfall due to climate change or blocking the bottom outlet of a detention basin, and is versatile in allowing for future adaptations with reduced interventions and costs. Urban planning and landscape reshaping allowed for low heights of overland flow, which assigns some confidence to the 1D overland flow modelling. A conventional sewer system (without any detention basin) designed for return periods of 5, 10 and 20 years would cost only less 13%, 9% and 4%, respectively, than the proposed system. However, maximum flow rates discharged to downstream would increase about 60%, 85% and 110%, respectively, compared with the obtained solution. Results highlight the potential benefits of a wider use of such solutions.

KEYWORDS

Flood mitigation, urban planning, SUDS, detention basins, green corridor, overland flow Modelling