

RINGKASAN

Kajian Drainase Berkelanjutan Di Perumahan Green Gayam Village Menggunakan Aplikasi Swmm 5.2

Study of Sustainable Drainage at Green Gayam Village Housing Using the SWMM 5.2 Application

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Abstrak

Pengelolaan air hujan di kawasan permukiman berkembang seperti Perumahan Green Gayam Village, Kabupaten Jember, memerlukan pendekatan sistem drainase yang berkelanjutan untuk meminimalkan risiko genangan air dan limpasan permukaan. Penelitian ini bertujuan untuk menganalisis curah hujan rancangan, mengevaluasi kelayakan serta kapasitas hidrolika sistem drainase eksisting, menghitung debit limpasan dan debit limbah domestik, serta merencanakan penerapan drainase berkelanjutan berbasis *Low Impact Development* (LID) menggunakan aplikasi EPA SWMM 5.2. Data curah hujan harian maksimum 10 tahun (2014–2023) dari Stasiun Rambipuji, Makam, dan Jember dianalisis menggunakan metode Distribusi Log Pearson Type III, yang menghasilkan curah hujan rancangan periode ulang 10 tahun sebesar 144,570 mm. Simulasi EPA SWMM 5.2 menunjukkan tingkat keandalan model yang sangat baik dengan *Surface Runoff Continuity Error* sebesar -0,09% dan *Flow Routing Continuity Error* sebesar 0,00%. Kecepatan aliran eksisting berkisar antara 0,01–1,77 m/s dengan debit limpasan puncak berkisar antara 0,002 m³/s hingga 0,045 m³/s. Debit limbah domestik total terhitung sebesar 0,001194 m³/s. Perencanaan saluran drainase dengan dimensi lebar (B) 0,50 m dan tinggi (H) 0,50 m terbukti aman menampung seluruh kombinasi debit buangan di semua blok perumahan. Penerapan sistem drainase berkelanjutan menunjukkan efisiensi infiltrasi yang optimal dengan tingkat resapan (*Infill Loss*) mencapai kapasitas maksimal 110,00 mm, sehingga efektif mereduksi beban limpasan permukaan.

Kata Kunci: Drainase Berkelanjutan; EPA SWMM 5.2; Green Gayam Village; Log Pearson Type III; LID.

Abstract

Rainwater management in developing residential areas, such as the Green Gayam Village housing complex in Jember Regency, requires a sustainable drainage system approach to minimize the risks of inundation and surface runoff. This study aims to analyze design rainfall, evaluate the feasibility and hydraulic capacity of the existing drainage system, calculate runoff and domestic wastewater discharge, and plan the implementation of sustainable drainage based on *Low Impact Development* (LID) principles using the EPA SWMM 5.2 application. Ten years of maximum daily rainfall

data (2014–2023) from the Rambipuji, Makam, and Jember stations were analyzed using the Log Pearson Type III distribution method, yielding a 10-year return period design rainfall of 144.570 mm. EPA SWMM 5.2 simulations demonstrated excellent model reliability, with a Surface Runoff Continuity Error of -0.09% and a Flow Routing Continuity Error of 0.00%. Existing flow velocities ranged from 0.01 to 1.77 m/s, with peak runoff discharge ranging from 0.002 m³/s to 0.045 m³/s. The total calculated domestic wastewater discharge was 0.001194 m³/s. Drainage channels designed with a width (B) of 0.50 m and a height (H) of 0.50 m proved capable of safely accommodating the combined discharge across all housing blocks. The implementation of the sustainable drainage system demonstrated optimal infiltration efficiency, with an infiltration capacity (Infill Loss) reaching a maximum of 110.00 mm, thereby effectively reducing the surface runoff load.

Keywords: Sustainable Drainage; EPA SWMM 5.2; Green Gayam Village; Pearson Type III Log; LID

