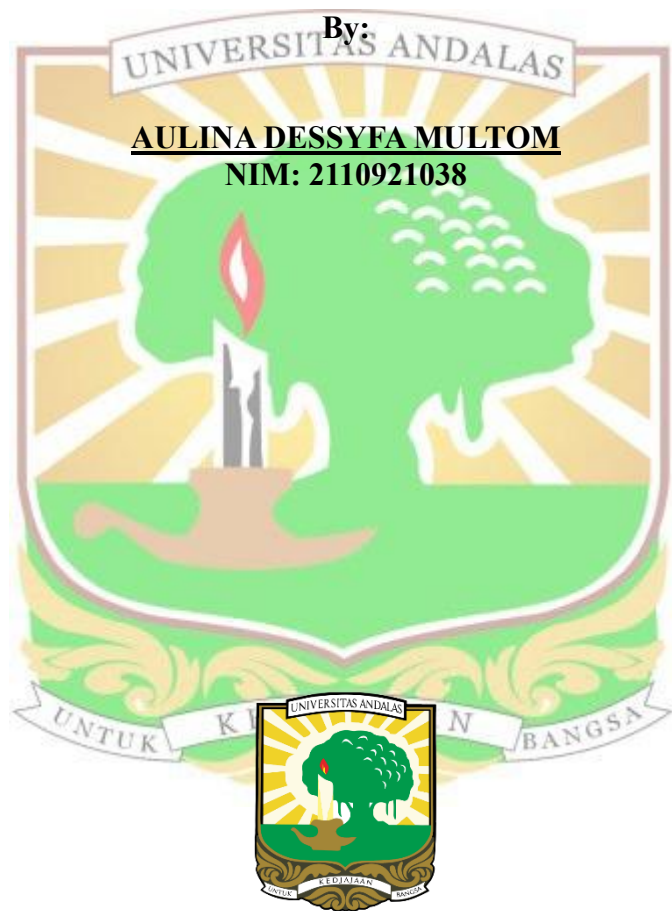


HYDRAULIC CAPACITY ANALYSIS USING HEC-RAS: A CASE STUDY OF SIMPANG KIRI RIVER, JOHOR, MALAYSIA

UNDERGRADUATE THESIS



**CIVIL ENGINEERING UNDERGRADUATE STUDY PROGRAM
DEPARTMENT OF CIVIL ENGINEERING
FACULTY OF ENGINEERING
ANDALAS UNIVERSITY**

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Submitted as one of the requirements for completing the Undergraduate
Program in the Department of Civil Engineering
Faculty of Engineering, Andalas University

By:

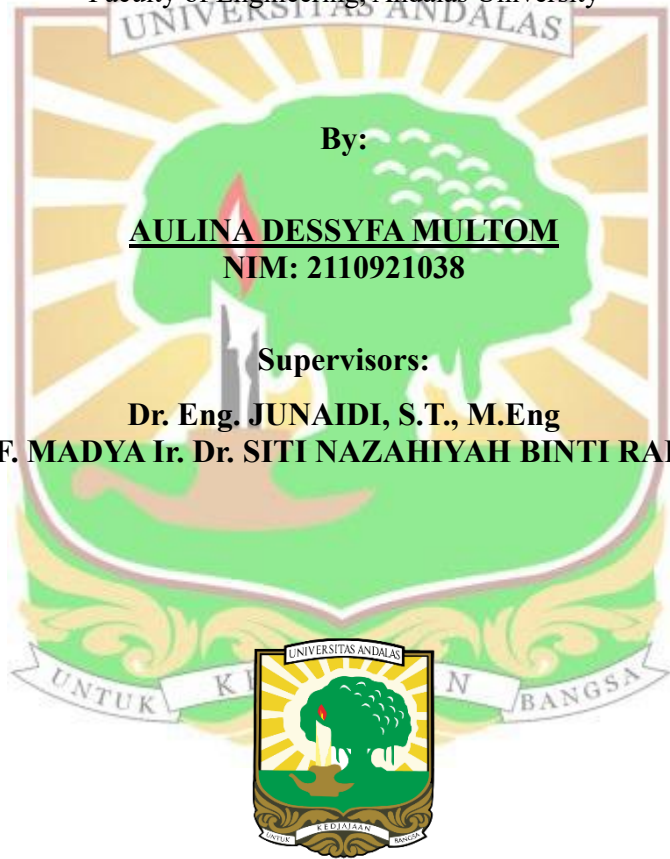
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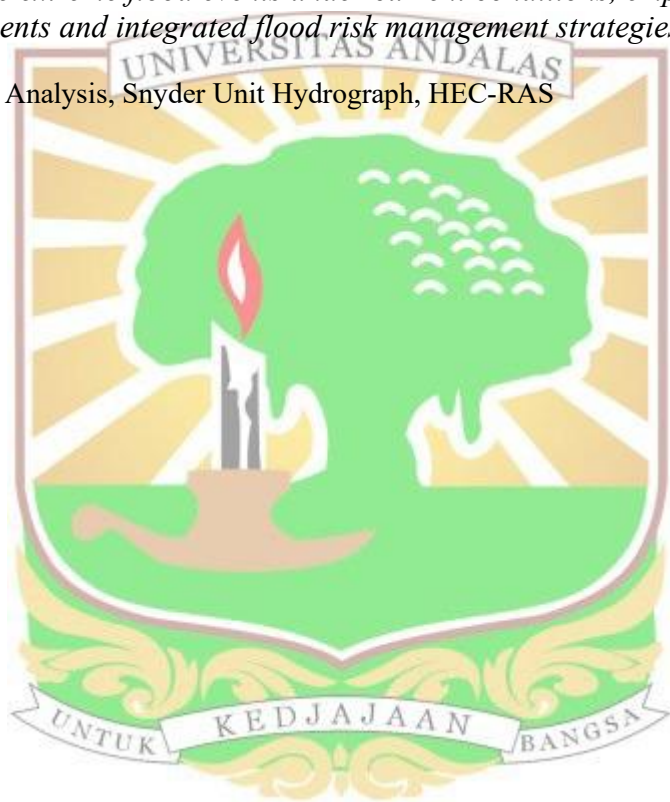
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ABSTRACT

Flooding remains a persistent issue in the Batu Pahat District of Johor, Malaysia, especially in the low-lying region of Mukim Seri Medan, where the Simpang Kiri River is located. This study aims to evaluate the hydraulic capacity of the Simpang Kiri River under various flood scenarios using the Hydrologic Engineering Center's River Analysis System (HEC-RAS). A total of four simulations were conducted: for 20-year and 100-year return periods, both with and without Climate Change Factors (CCF). Rainfall data from the Empangan Sg. Sembrong station were used in conjunction with the Snyder Unit Hydrograph method to estimate peak discharges, which were subsequently used as boundary conditions in the hydraulic model. The results indicated that for both return periods, particularly when adjusted for climate change, water surface elevations exceeded riverbank elevations in several sections of the channel, suggesting a high risk of overbank flooding. The findings highlight the insufficient capacity of the Simpang Kiri River to manage extreme flood events under current conditions, emphasizing the need for structural improvements and integrated flood risk management strategies.

Keywords: Hydraulic Analysis, Snyder Unit Hydrograph, HEC-RAS



ABSTRAK

Banjir merupakan permasalahan yang terus berlanjut di Distrik Batu Pahat, Johor, Malaysia, khususnya di wilayah dataran rendah Mukim Seri Medan, tempat Sungai Simpang Kiri berada. Penelitian ini bertujuan untuk mengevaluasi kapasitas hidraulik Sungai Simpang Kiri dalam menghadapi berbagai skenario banjir dengan menggunakan perangkat lunak Hydrologic Engineering Center's River Analysis System (HEC-RAS). Sebanyak empat simulasi telah dilakukan, yakni untuk periode ulang 20 tahun dan 100 tahun, masing-masing dengan dan tanpa mempertimbangkan Faktor Perubahan Iklim (Climate Change Factors, CCF). Data curah hujan dari Stasiun Empangan Sungai Sembrong digunakan bersama dengan metode Hidrograf Satuan Snyder untuk memperkirakan debit puncak, yang selanjutnya dijadikan sebagai kondisi batas dalam pemodelan hidraulik. Hasil simulasi menunjukkan bahwa pada kedua periode ulang, terutama yang disesuaikan dengan perubahan iklim, elevasi muka air melebihi elevasi tebing sungai di beberapa segmen saluran, yang mengindikasikan risiko tinggi terjadinya banjir luapan. Temuan ini menunjukkan bahwa kapasitas Sungai Simpang Kiri tidak memadai untuk mengatasi kejadian banjir ekstrem dalam kondisi saat ini, sehingga diperlukan peningkatan struktural dan strategi manajemen risiko banjir yang terintegrasi.

Kata Kunci: Analisis Hidraulik, Hidrograf Satuan Snyder, HEC-RAS

