UNIVERSITI TEKNOLOGI MARA

THE EFFECTS OF NON-MIGRATING MID-BAR TO LATERAL MIGRATION

ZAMSALWANI BINTI ZAMRI

Thesis submitted in fulfillment
of the requirement for the degree of
Doctor of Philosophy

Faculty of Civil Engineering

April 2018

AUTHOR'S DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulation of Universiti Teknologi MARA. It is original and is the results of my own work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any degree or qualification.

I, hereby, acknowledge that I have been supllied with the Academic Rules and Regulation for Post Graduate, Universiti Teknologi MARA, regulating the conduct of my study and research.

Name of Student	:	Zamsalwani binti Zamri
Student I.D. No.	:	2013202518
Programme	:	Doctor of Philosophy (Civil Engineering) - EC950
Faculty	:	Civil Engineering
Thesis Title	:	The Effects of Non-Migrating Mid-Bar to Lateral Migration
Signature of Student	:	Zamsalwani
Date	:	April 2018

ABSTRACT

Lateral migration is the net outcome of erosion and deposition processes. It initiates and develops width adjustment and planform evolution. Lateral migration process involves adjustment of the planimetric geometry and hydraulic factors that lead to sediment deposition on the river bed. Formation of mid-bar is a result of erosion and deposition process in the river. Many structures built within the vicinity of the river such as bridges, waterways/ navigation and flood control contraptions are affected by lateral migration processes and non-migrating mid-bar as a rigid structural in the middle of the channel. Effects of variation of discharge, the morphology evolution is affected and influences expansion area of mid-bar, low-curvature degree in the channel planform and presence of obstacle. The research on the effects of non-migrating mid-bar was carried out on a physical river channel model measuring 47 m long, 2.4 m wide and 1.8 m deep located at Universiti Teknologi MARA Puncak Alam. The non-migrating mid-bar was built between 8 m to 11 m from the V-notch location. The experiment was designed with various discharge (13.53 m^3/hour, 10.91 m^3/hour, 8.62 m^3/hour and 6.64 m^3/hour) and degree of deflection used in the experiment are 37 degree, 25 degree and 15 degree. Bed elevation, bankline point and velocity were measured at specified locations. Correlation analysis between the lateral migration rate, M and mean velocity, U_{mean} to other variables were further examined and analysed for the development of a predictive relationship using discrepancy ratio (DR) and root-mean-square error (RMSE) as validation methods. Statistical analysis, artificial neural network (ANN) and linear least squares (LLS) were conducted using the selected variables obtained through dimensional analysis in order to identify the relationship between lateral migration rate to hydraulic characteristics, water properties, soil capacity and gravitational acceleration variables. Most of these methods of analysis were performed to establish the empirical equation of lateral migration rate as a dependent variable and the other variables as independent variables. The selection of the most appropiate variable is based on the value of r-squared (R^2), DR and RSME percentage. The selected predictive variables explain the effect of non-migrating bar to lateral migration. The analysis concluded that ANN predicts lateral migration rate satisfactorily. The percentage of accuracies for this model based on R^2, DR and RMSE are 96.40%, 100% and 7.44% respectively.

ACKNOWLEDGEMENT

Alhamdullilah. First and foremost, praise and thanks to Allah for blessing that has been bestowed upon me

I am deeply thankful to my parents, Zamri Ramli and Saliah Md Ariffin for unconditional love and encouragement during these difficult years. For my siblings, Zamsazli, Zamsalwana, Zamsazlan and Anis Fathihah, thank for supporting me. They always been there for me and I am thankful for everything they have helped me achieve.

I am grateful to my advisor, Prof. Ir. Dr. Junaidah Ariffin for her valuable guidance, motivation and patience throughout my PhD journey. Thank for her constant encouragement given to me over the year. The completion of this study would not have been possible without her generous support. I extend my sincere thanks to Dr Jazuri Abdullah for his helpful comments encouragement and necessary advice.

I wish to thank my friends; Duratul, Azlinda, Saerahany and Mazlina for helping me to survive all the stress and not letting me give up.

TABLE OF CONTENTS