DEVELOPING A NEW MODEL OF RIVER FLOW SIMULATION AT KERTEH RIVER CATCHMENT AREA USING REMOTE SENSING AND GIS TECHNOLOGY (AVSWAT)

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DEVELOPING A NEW MODEL OF RIVER FLOW SIMULATION AT KERTEH RIVER CATCHMENT AREA USING REMOTE SENSING AND GIS TECHNOLOGY (AVSWAT)

By

Wong Fen Fen

Research Report submitted in partial fulfillment of
the requirement for the degree of
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DECLARATION AND VERIFICATION REPORT

FINAL YEAR RESEARCH PROJECT

It is hereby declared and verified that this research report entitled:
Developing a New Model of River Flow Simulation at Kerteh River Catchment Area Using Remote Sensing and GIS Technology (AVSWAT) by Wong Fen Fen, Matric No. UK17088 have been examined and all errors identified have been corrected. This report is submitted to the Department of Marine Science as partial fulfillment towards obtaining the Degree of Bachelor of Science (Marine Science), Faculty of Maritime Studies and Marine Science, Universiti Malaysia Terengganu.

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LIST OF ABBREVIATIONS

AVSWAT	- ArcView Soil and Water Assessment Tool
SWAT	- Soil and Water Assessment Tool
US	- United States
ET	- Evapotranspiration
km^2	- Kilometer square
GIS	- Geographical Information System
DDT	- dichloro-diphenyl-trichloroethane
HRU	- Hydrological Response Unit
USDA-ARS	- United State Department of Agriculture's Agricultural Research Service
DEM	- Digital Elevation Model
STATSGO	- State Soil Geographic database
SSURGO	- Soil Survey Geographic database
GPS	- Global Positioning System
ms^{-1}	- Meter per second
CN	- Curve number
RSO	- Rectified Skew Orthomorphic
°	- Degree
%	- Percentage

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ABSTRACT

The Kerteh River catchment area located at the South of Kuala Terengganu with total area of 275 km^2. Like all river beds, Kerteh River also undergone continuously changing due to the influence of natural phenomena and anthropogenic features nearby which imposed the river and its flow. The SWAT model is a potential useful tool for operation and water/land management studies. It is used to predict the impact of land management practices on water flow. SPOT-5 satellite image was used for land cover mapping processes and seven types of land cover were determined for the catchment area. The SWAT model was simulated using 11 years of weather input data which from year 2000 to 2010. Total of 42 Sub-basins were created from the SWAT model and only Sub-basin 41 and Sub-basin 42 are considered in this study. The simulation result from SWAT for river flow was being compared to the in-situ river flow data after that. From the correlation of coefficient analysis, there were strong relationship between In-situ data and simulation data from AVSWAT for both Sub-basin 41 and Sub-basin 42. The value of R for both Sub-basin 41 and Sub-basin 42 are 0.9047 and 0.8867 respectively. Correlation greater than 0.8 means the river flow rates and volume of river flow out show significant correlation between them. Thus, river flow simulation model of Kerteh River catchment area has been successfully created and the SWAT model can be reliably used to model stream flow.

PENGHASILAN SATU MODEL SIMULASI ALIRAN SUNGAI YANG BARU DI KAWASAN TADAHAN SUNGAI KERTEH MENGGUNAKAN TEKNOLOGI PENDERIAAN JAUH DAN GIS (AVSWAT)

ABSTRAK

Kawasan tadahan Sungai Kerteh terletak di Selatan Kuala Terengganu dengan jumlah keluasan 275 km^2. Seperti sungai yang lain, Sungai Kerteh juga mengalami perubahan sepanjang masa disebabkan pengaruh daripada fenomena alam semulajadi dan ciri-ciri antropogenik yang berdekatan di mana akan mempengaruhi sungai dan alirannya. Soil and Water Assessment Tool (SWAT) adalah satu kaedah yang berguna dalam operasi dan pengurusan air dan tanah. Ia telah digunakan untuk meramalkan praktis pengurusan tanah dalam aliran air. Satelit imej SPOT-5 telah digunakan dalam proses pemetaan tanah litupan dan tujuh jenis litupan tanah telah ditentukan untuk kawasan tadahan tersebut. SWAT model telah disimulasi dengan menngunakan data cuaca selama 11 tahun daripada tahun 2000 hingga 2010. Sebanyak 42 sub-tadahan telah dicipta daripada SWAT model dan hanya Sub-tadahn 41 dan Sub-tadahan 42 dititikberatkan dalam kajian ini. Keputusan daripada simulasi SWAT untuk aliran sungai telah dibandingkan dengan data aliran sungai in-situ selepas itu. Daripada analisis korelasi, terdapat hubungan yang kuat di antara in-situ data dan data simulasi daripada AVSWAT untuk kedua-dua Sub-tadahan 41 dan Sub-tadahan 42. Nilai R untuk kedua-dua sub-tadahan 41 dan Sub-tadahan 42 adalah 0.9047 dan 0.8867 masing-masing. Korelasi lebih daripada 0.8

bermaksud kadar aliran sungai dan isipadu pengaliran sungai keluar menunjukkan korelasi yang penting antara mereka. Lantas, simulasi pengaliran sungai untuk kawasan tadahan Sungai Kerteh telah dihasilkan dengan jayanya dan SWAT model dapat digunakan dengan tahap kebergantungan yang tinngi untuk pemodelan aliran sungai.