

Sarawat Jamrussri 2008: The Study on Variation of Dissolved Oxygen and Biochemical Oxygen Demand in the Upper Ping River by an Application of WASP Model. Master of Engineering (Water Resources Engineering), Major Filed: Water Resources Engineering, Department of Water Resources Engineering. Thesis Advisor: Associate Professor Nutchanat Sriwongsitanon, Ph.D. 318 pages.

This study aims to investigate the changes of water quality parameters, consisting of DO and BOD, in the Upper Ping River between gauging stations P.20 and P.73 by the applications of three mathematical models, which are the URBS, FLDWAV, and WASP Models. The events occurring between 3<sup>rd</sup> September 2005 and 9<sup>th</sup> May 2007 were used for model calibration and model verification. The application of the URBS Model has the objective of estimating flow hydrographs from the ungauged catchments in the basin and can be later used as the input data for the FLDWAV Model. The application of the FLDWAV Model has the objective of estimating water velocity, water flow, water depth, and water volume of each reach in the Upper Ping River and can be used as the input data for the WASP Model. For the application of the WASP Model, BOD loading estimated by the direct estimation and conventional methods were compared and the suitable method, that provided the corresponding values of calculated and observed DO and BOD, was chosen. Main results of the model calibration and model verification of the WASP Model are described as follows. Firstly, BOD loading estimated by the direct estimation is a suitable method for this study. Secondly, water quality during the model calibration and verification processes are within the surface water of type 3. Lastly, there are 7 parameters, that have significant effects on the concentration of DO and BOD, which are (1) Global reaeration rate constant at 20 °C ( $k_2$ ), (2) Oxygen to carbon stoichiometric ratio ( $a_{OC}$ ), (3) Decay rate constant at 20 °C ( $k_d$ ), (4) Nitrification rate constant at 20 °C ( $k_{12}$ ), (5) Phytoplankton growth rate at 20 °C ( $G_{P1}$ ), (6) Phytoplankton respiration rate at 20 °C ( $k_{1R}$ ) and (7) Dispersion Coefficient ( $k_{ds}$ ). The sensitivity study for evaluating the degree of these parameters' values that would have the effects on the concentration of DO and BOD was therefore investigated. The overall results of the calibration and verification processes of those three models are acceptable. It can be seen from the statistical index's values of the Correlation Coefficient, RMSE, and the Efficiency Index, which are in good ranges. Control parameters of those models are therefore acceptable and can be used to evaluate water quality situation of the Upper Ping River. The results reveal that water quality in 2017 and 2027 of the Upper Ping River will be continuously degraded compared with the current situation.

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