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Evaluation of Operations Scenarios for Managing the Big Creek Marsh

Ian Wilson (1), Masihur Rahman (2), Jeremy Wychreschuk (3), Dan Lebedyk (4), and Tirupati Bolisetti (5)

(1) Formerly Civil and Environmental Engineering, University of Windsor, Windsor, ON, N9B3P4, Canada (hoodlemming@hotmail.com), (2) Civil and Environmental Engineering, University of Windsor, Windsor, ON, N9B3P4, Canada (rahma25@uwindsor.ca), (3) Formerly at Essex Region Conservation Authority, Essex, ON, Canada, N8M1Y3 (jeremy.wychreschuk@aecom.com), (4) Essex Region Conservation Authority, Essex, ON, Canada, N8M1Y3 (DLebedyk@erca.org), (5) Civil and Environmental Engineering, University of Windsor, Windsor, ON, N9B3P4, Canada (tirupati@uwindsor.ca)

Wetland management in changing climate is important for maintaining sustainable ecosystem as well as for reducing the impact of climate change on the environment as wetlands act as natural carbon sinks. The Big Creek Marsh within the Essex County is a Provincially Significant Wetland (PSW) in Ontario, Canada. The marsh is approximately 900 hectares in area and is primarily fed by streamflow from the Big Creek Watershed. The water level of this wetland has been managed by the stakeholders using a system of pumps, dykes and a controlled outlet to the Lake Erie. In order to adequately manage the Big Creek Marsh and conserve diverse aquatic plant species, Essex Region Conservation Authority (ERCA), Ontario has embarked on developing an Operations Plan to maintain desire water depths during different marsh phases, viz., Open water, Hemi and Overgrown marsh phases.

The objective of the study is to evaluate the alternatives for managing water level of the Big Creek Marsh in different marsh phases. The Soil and Water Assessment Tool (SWAT), a continuous simulation model was used to simulate streamflow entering into the marsh from the Big Creek watershed. A Water Budget (WB) model was developed for the Big Creek Marsh to facilitate in operational management of the marsh. The WB model was applied to simulate the marsh level based on operations schedules, and available weather and hydrologic data aiming to attain the target water depths for the marsh phases. This paper presents the results of simulated and target water levels, streamflow entering into the marsh, water releasing from the marsh, and water pumping into and out of the marsh under different hydrologic conditions.