Geophysical Research Abstracts
Vol. 21, EGU2019-11045-1, 2019
EGU General Assembly 2019

Application of managed dyke realignment and hydrodynamic modelling for flood mitigation in a hypertidal estuary in the Upper Bay of Fundy, Canada

Julia Purcell (1), Ryan Mulligan (2), Danika van Proosdij (1), and Jennie Graham (3)
(1) Saint Mary's University, Halifax, Canada, (2) Queen's University, Kingston, Canada, (3) CBWES Inc., Halifax, Canada

Low-lying communities protected by dykes are at increasing risk to climate change impacts. A strategy that is increasingly recognized as a viable option for flood protection and mitigation of these communities is managed realignment of dyke infrastructure. In hypertidal, developed estuaries such as the Salmon River Estuary in the Upper Bay of Fundy, the town of Truro, Nova Scotia, is one such community that may benefit from managed realignment to expand the floodplain. Before managed realignment is implemented, hydrodynamic modelling must be done to determine the best location for new dykes further inland and breaches in the existing dyke infrastructure. This task presents challenges, however, as the bathymetry of the Salmon River is highly variable due to its hypertidal environment with high suspended sediment concentrations and frequent high river discharge events. To address this challenge, Delft3D was used to model the hydrodynamics within a portion of the Salmon River south of the Onslow North River Marsh Body and identify the sensitivities presented in model outputs as a result of changing the bathymetry. Model outputs using bathymetry from the spring of 2014 are compared to model outputs using newer bathymetry that was collected in August 2018 using a SonTek M9 HydroSurveyor at high tide times and an unmanned aerial system (UAS) survey of the edges of the Salmon River at low tide times. The hydrodynamic model was initialized and calibrated using WebTide, a tidal prediction model, and four water level recorders. To validate the model results, field data were collected at the same time the new bathymetry was collected and during the same time period the model was run for in August 2018. This includes the deployment of two Acoustic Doppler Velocimeters (ADVs), two Acoustic Doppler Current Profilers (ADCPs), two Optical Backscattering (OBS) sensors, and two water samplers (ISCOs) over four tidal cycles in August 2018 to collect information on flow velocity, water depth, and suspended sediment concentration. Preliminary results of field data collection show flow velocities ranging from approximately 0.06 m/s to 0.77 m/s over a tidal cycle, water depths upwards of 2.71 m above mudflats that are dry at low tide, and suspended sediment concentrations upwards of 70 g/L. Validating model results with these results will help determine the ability of Delft3D to simulate real hydrodynamic conditions in the Salmon River and whether hydrodynamic models are necessary for planning and implementing managed realignment projects in low-lying coastal communities.