

Wetland Water Balance Modelling Analysis: Forensic Review

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Executive Summary

As the hydrology of wetlands can be very complex, a reviewer must check that the submitted feature based water balance analysis report demonstrates proper understanding of each components of the wetland hydrology separately along with proposed methods supported by credible scientific references to estimate each component of the wetland hydrology.

There are different sources of uncertainty to any hydrologic modeling exercise, such as input uncertainty, inherent model structure uncertainty and water level or discharge measurement uncertainty; therefore the hydrologic model for the feature based water balance analysis must be calibrated with sufficient baseline monitoring, in order to reduce some of these uncertainties. Only the calibrated hydrologic model can be used to establish the target hydroperiod for the wetland.

Proper characterization of the nature and extent of the hydrogeological layers through which groundwater moves is extremely important for wetlands significantly fed by groundwater or that drain internally.

Specific recommendations may include:

- Consider recommending slug tests for hydraulic conductivity measurements, particularly for internally drained wetlands, also known as isolated wetlands. These wetlands are sensitive because they have no surficial outlet/outflow, so the overall water budget is sensitive to errors in the infiltration/recharge component of the water budget as determined by the hydraulic conductivity. This means that accuracy in calculating the hydraulic conductivity becomes critically important to assessing pre-to-post changes to the water balance of the wetland. Therefore, it is critical that for such wetlands, a slug test or similar test has to be completed to accurately estimate the hydraulic conductivity of the surficial geology and underlying stratigraphy. It is also recommended that this requirement be included in the next update to the TRCA SWM Criteria document.
- Require that sources be provided for all equations used.
- Require that sources be provided (measurement, book value reference) for any constants used.
- Require sources be provided for key parameters such as evapotranspiration, hydraulic conductivity, etc.
- Any alterations to standard procedure made need to be justified (e.g. discharge adjustment factor) and explicitly stated.
- Reviewers need to be aware of these red flags throughout their reviews.