

EEMS Demonstration Model Description

DM_1DRiver_WASP_Linkage

1 Objective

This demonstration model uses EFDC+ Explorer (EE) and EFDC+ to simulate hydrodynamics and water quality in a one-dimensional (1D) river system. Its primary purpose is to compare EFDC+ water quality output directly against results produced by the WASP7 water quality model using an identical hydrodynamic forcing file, and to benchmark both against a steady-state analytical solution.

The comparison demonstrates that EFDC+ and WASP7 produce nearly identical water quality results for a similarly configured model while EFDC+ runs substantially faster due to its multi-threading capability.

2 Model Description

The model configuration is summarized in Table 1 and the model domain is shown in Figure 1. Other than the summarized settings, WASP7/8 Linkage is also selected under the Linkages. The water quality simulation includes the following state variables, consistent with the WASP7 model state variable set:

- Dissolved Organic Carbon (DOC)
- Dissolved Oxygen (DO)
- Ammonia Nitrogen ($\text{NH}_4\text{-N}$)
- Nitrate/Nitrite Nitrogen ($\text{NO}_3\text{-N}$)

Boundary concentrations are specified at the upstream inflow ($I=3$, $J=102$) and the WWTP discharge point ($I=3$, $J=98$). The WWTP effluent introduces elevated DOC and nutrient loading, generating a classic dissolved oxygen sag downstream of the discharge that recovers through reaeration in the lower reach.

Table 1 Model configuration summary

Run Period (Julian Time)	Horizontal cells	Vertical layers	Activated modules
6756-6766	100 cells	1 layer	• Hydrodynamics • Temperature • Water Quality

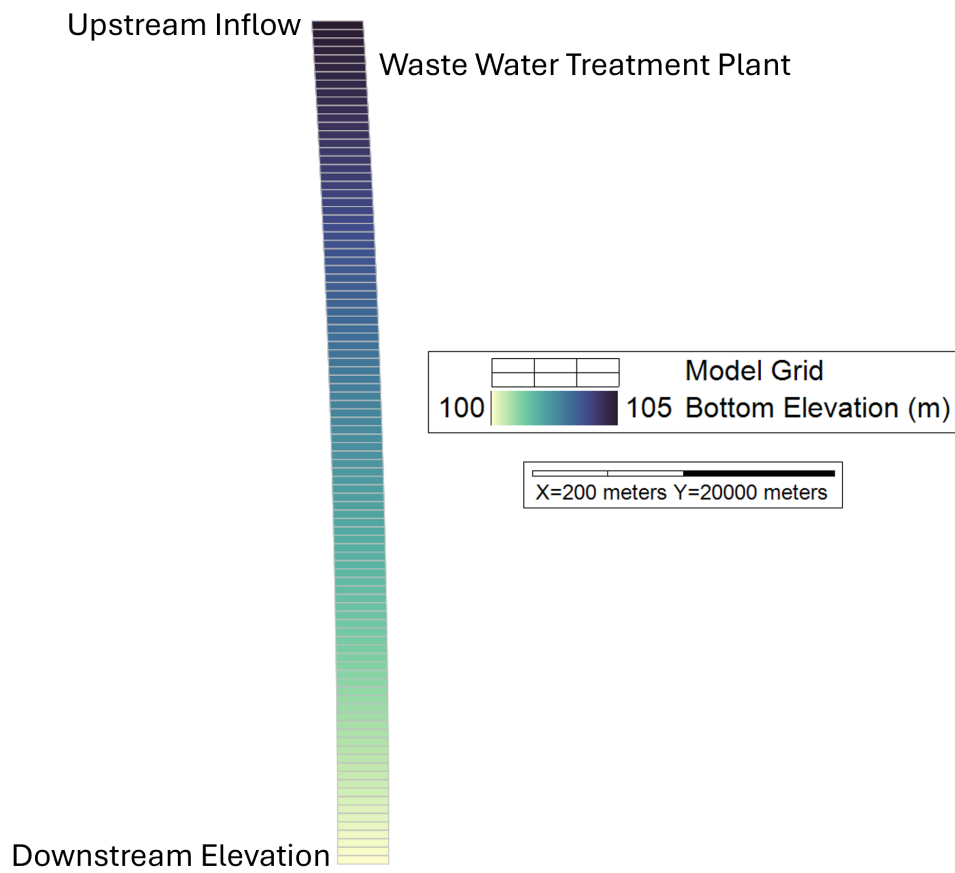


Figure 1 Model domain

3 Model Results

Figure 2 shows the depth-averaged DO distribution along the river reach at the end of simulation for both WASP and EFDC+ models. DO ranges from approximately 5.0 to 8.0 mg/L, with the lowest values occurring downstream of the WWTP outfall and recovery evident in the lower reaches. As Figure 2 demonstrates, the EFDC+ WQ model produces results similar to those for the WASP model, however WASP runs slower than EFDC+ which uses multi-threading technology. Figure 3 shows the 2D horizontal view of dissolved oxygen concentration in the middle of simulation period at Julian time 6760.

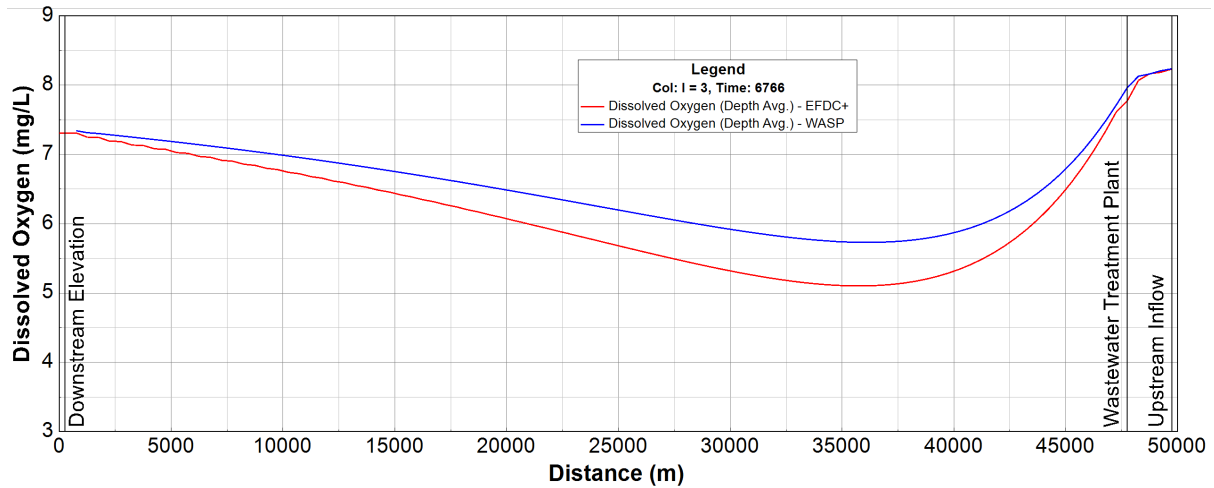


Figure 2 Longitudinal profile of dissolved oxygen comparing EFDC+ and WASP results

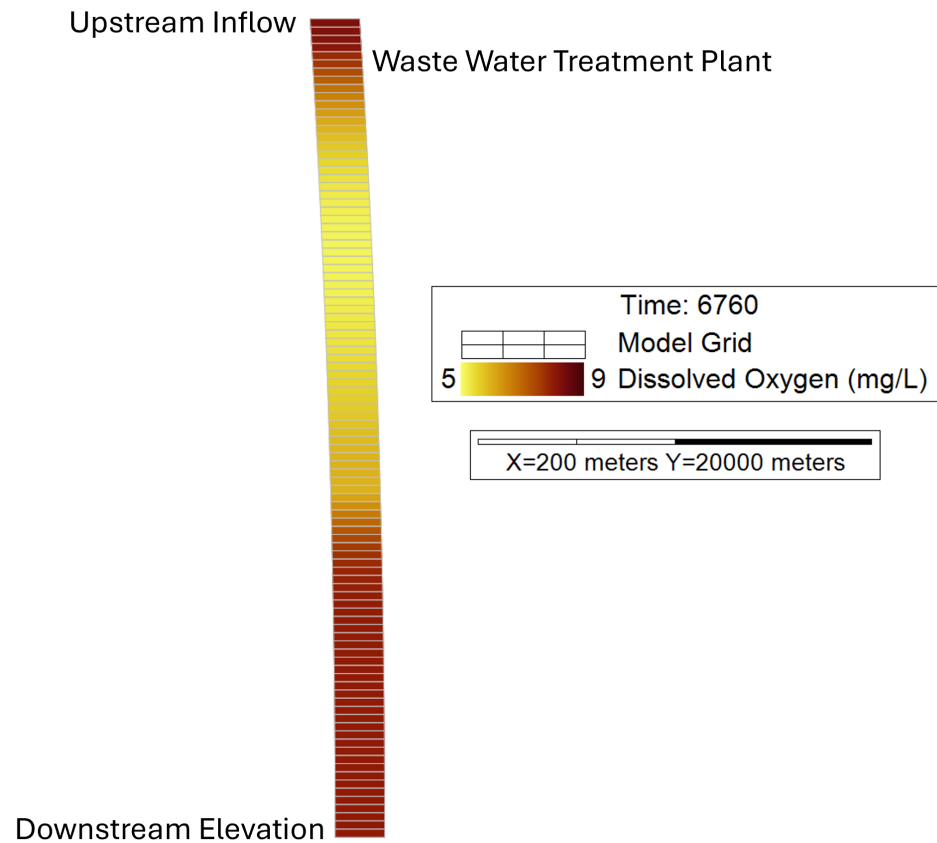


Figure 3 2D horizontal view of the dissolved oxygen concentration at Julian time 6760

4 Notes

4.1 Disclaimer

This model is provided to demonstrate that EFDC+ Explorer and EFDC+ can be used to build and analyze this type of models. The simulation results are consistent with expected behavior; however, the model should not be considered a final or validated product. Users are encouraged

to review, modify, and refine model parameters to obtain results appropriate for their specific application.

4.2 EEMS Demo Mode

In Demo mode, the model is validated against a set of predefined signatures, including grid size, domain area, center coordinates, transport count, and module configuration. While certain parameter values may be adjusted, the grid cannot be modified, transports cannot be added, and the prescribed module setup cannot be altered. Any deviation from these conditions results in the model no longer being considered a valid demo model.

4.3 Support

For technical support, additional documentation, or to obtain the latest version of EFDC+ Explorer, please visit: www.eemodelingsystem.com