CE 5362 Surface Water Modeling
Project 7

Introduction and Purpose

SToRM is a component of the USGS Multi-Dimensional Surface Water Modeling System (McDonald and others, 2012) SToRM is one of a generation of recently available 2–D hydrodynamic models available without charge or for low cost. This project is to gain experience using the model to determine if there is hydrodynamic evidence of advantage of placing a basin (grit chamber) within a larger stormwater basin for water quality benefit.

Problem Background

Figure 1 is a plan view map of an ordinary stormwater basin, conceptualized in SToRM. The berm on the left is to prevent short circuiting from the inlet to the outlet, thereby using the entirety of the basin for water quality enhancement (increase residence time). Figure 2

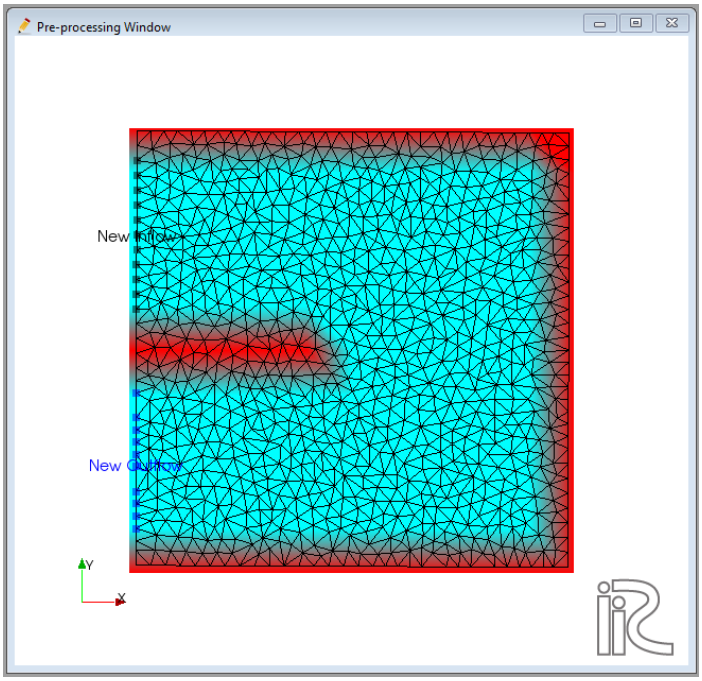

Figure 1: Aerial view of Ordinary Basin. The red portion is elevation 4 meters, light blue is elevation 1 meters. Inflow and outflow are shown.

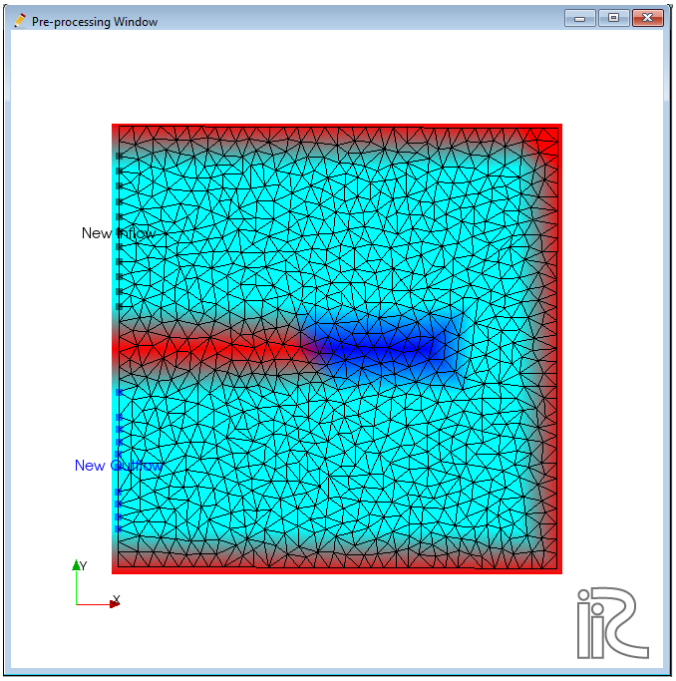

Figure 2: Aerial view of Basin-In-Basin concept. The red portion is elevation 4 meters, light blue is elevation 1 meters, and the dark blue is 0 meters. Inflow and outflow are shown.

The dark blue "hole" is thought to confer advantage by reducing velocity of water in its vicinity, thus suspended constituents could conceivably be captured in this region, if indeed the velocity field is affected.

Topographic Model for the Basins

SToRM uses a topographic database in XYZ format. Simple regular topographic files are built for the two basins `pond-no-hole.tpo` and `pond-in-pond.tpo`.

Problem Statement

Build and run a SToRM model of the two conceptual designs described above using identical boundary conditions, write a brief report (like a lab report) and include:

1. Does there appear to be different circulation patterns in the two basins?
2. Produce vector and streamline plot of the flow pattern at in each model at large time (equilibrium); something like

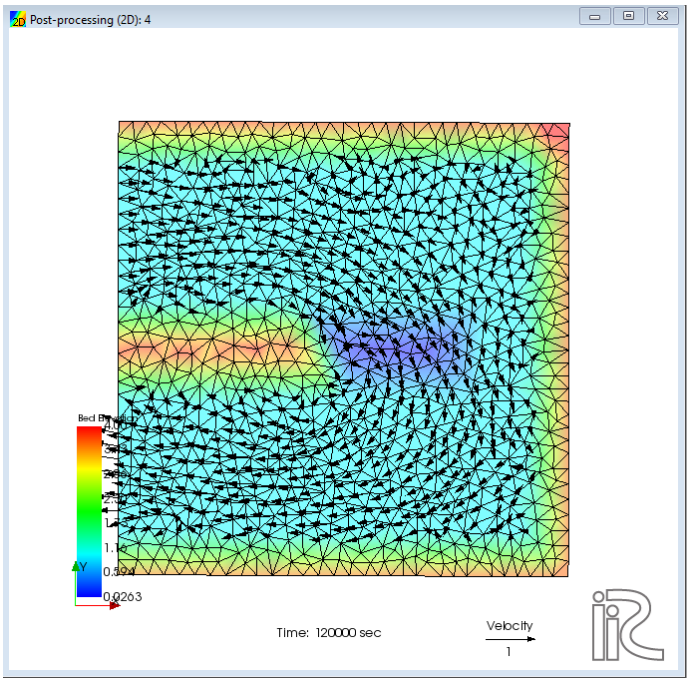

Figure 3: Basin-In-Basin concept, equilibrium plots for $Q_{in} = 2.0\ cms$, $H_{out} = 2.0\ m$.

3. Interpret the two sets of plots; is there influence of the hole; what is that influence; how would it affect water quality control if the goal is to remove suspended solids

4. (Advanced) Edit the `.tpo`, and move the hole to different locations; comment on any meaningful effects; Is the hole best placed as presented, or is closer to the inlet better; closer to the outlet?

References

USGS Geomorphology Laboratory (2011). System for Transport and River Modeling. `http://wwwbrr.cr.usgs.gov/projects/GEOMORPH_Lab/project-SToRM.html` Webpage last accessed, 12 Jan 2012.

McDonald, R.R., Nelson, J.M., and Bennett, J.P., (2012). *in press.* Multi-dimensional surface-water modeling system user's guide: U.S. Geological Survey Techniques and Methods, 6-B2, 136 p.