This user manual is to demonstrate the river simulation function in the new edition of VSAFT2. The version information can be seen by pressing “Help>>About”.

The latest version can be downloaded at the following link:
http://tian.hwr.arizona.edu/downloads/
Forward simulations:

Subsurface part:
Consider a forward 10 by 10 transient flow in horizontal plane.
Random K field generation.

Initial condition is given by a constant total head $H = 100$ as the steady state head distribution.

Boundary conditions are set by a constant total head $H = 100$ at the top and bottom boundaries. I skip a point on the bottom boundary without setting a boundary condition to see the river behavior in this case.
Press "Next" to step through the rest settings to the last tab. Press “Finish” to save the project at a desire directory.

The subsurface part is done so far. Now we are going to set up the river part.
**River part:**

Press “Construct>>River>>Add” to draw a river.

Press [Left Mouse Button] to add river nodes from the upstream to the downstream.

Press [Right Mouse Button] to delete the last river node.

The upstream of river is set at the center point of bottom boundary in this case. We should set river nodes along each grid, because we will compute the interaction between river and groundwater only on the river nodes.

We can press “Construct>>River>>Delete” to delete the whole river if necessary.

Once we finish the river generating, press “Construct>>River>>Edit” to open the parameter setting dialog.

We can set the upstream inflow by the time-discharge table on the right hand side. The river bed slope, river width, Manning’s n value and the leakage coefficient can be adjusted in blocks on the left.
Press “Save” to generate/renew a “river.dat” file under the project directory. We can also press “Construct>>River>>Import” to import an existing file with the same format as “river.dat”. Press “Construct>>River>>Plot River” to replot the river if it is not shown in some cases.

The river part is all set now. Basically the settlements of river part and groundwater part are separated, so we don’t need to save the subsurface settlement again.

Press “Run>>VSAFT2” to compute. We can see the river effect in the pressure contour plots.
The river depth, river total head, riverbed elevation, specific discharge from river to subsurface, river discharge, and subsurface total head are recorded in “O_hr.dat” in the project directory, which is written in Tecplot format.

**Inverse simulations:**

While solving an inverse case, we will save the forward project as a new inverse project. This step will NOT copy the “river.dat” file to the new project. The steps are basically the same as the former version of VSAFT2. We can simply press “Construct>>River>>Edit” and then “Save” to generate/renew the “river.dat” file, or import an existing “river.dat”, then press “Run>>VSAFT2”.

![Graph showing river depth and total head variations](image-url)