Test 3 – Momentum conservation over a small obstruction.

1. Modelling performance tested

The objective of the test is to assess the package's ability to conserve momentum over an obstruction in the topography. This capability is important when simulating sewer or pluvial flooding in urbanised floodplains. The barrier to flow in the channel is designed to differentiate the performance of packages without inertia terms and 2D hydrodynamic packages with inertia terms. With inertia terms some of the flood water will pass over the obstruction.

2. Description

This test consists of a sloping topography with two depressions separated by an obstruction as illustrated in Figure (a). The dimensions of the domain are 300m longitudinally (X) x 100m transversally (Y). A varying inflow discharge, see Figure (b), is applied as an upstream boundary condition at the left-hand end, causing a flood wave to travel down the 1:200 slope. While the total inflow volume is just sufficient to fill the left-hand side depression at x=150m, some of this volume is expected to overtop the obstruction because of momentum conservation and settle in the depression on the right-hand side at x=250m. The model is run until time T=900s (15 mins) to allow the water to settle.

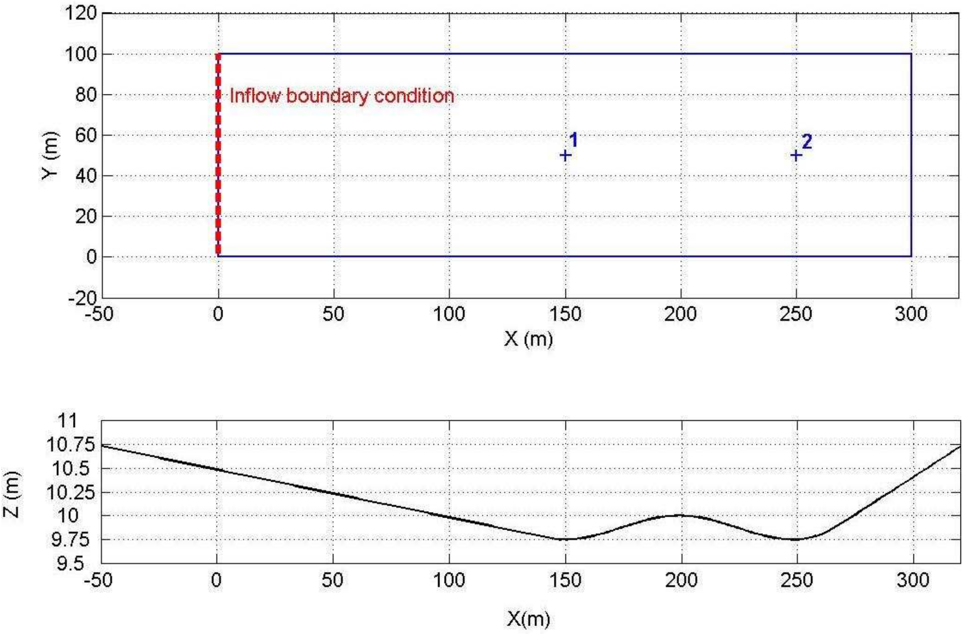

Figure (a): Plan and profile of the DEM use in Test 3. The area modelled is a perfect rectangle extending from X=0 to X=300m and from Y=0 to Y=100m as represented.

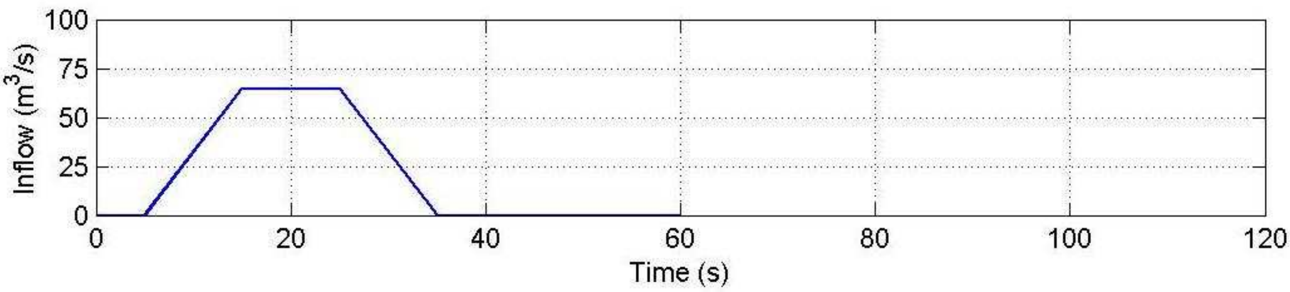

Figure (b): Inflow hydrograph used as upstream boundary condition.

3. Boundary and initial conditions

Inflow boundary condition along the dashed red line in Figure (a). Table provided as part of dataset.

All other boundaries are closed.

Initial condition: Dry bed.

4. Parameter values

Manning's n: 0.01 (uniform)

Model grid resolution: 5m

(or ~1200 nodes in the area modelled)

Time of end: the model is to be run until time t = 15 mins

5. Required output

Software package used: version and numerical scheme.

Specification of hardware used to undertake the simulation: processor type and speed, RAM.

Minimum recommended hardware specification for a simulation of this type.

Time increment used, grid resolution (or number of nodes in area modelled) and total simulation time to specified time of end.

Numerical predictions of **velocity** and **water level** versus time (output frequency 2s) at location 1 (centre of the first depression) defined below.

Numerical predictions of **water level** versus time (output frequency 2s) at location 2 (centre of the second depression) defined below.

Location	X	Y
1	150	50
2	250	50

6. Dataset content

Description	File Name
Georeferenced Raster ASCII DEM at resolution 2m	Test3DEM.asc
Upstream boundary condition table (discharge vs. time)	Test3BC.csv

7. Additional comments

Linear interpolation should be used to interpolate inflow values.

It is pointed out that results may be significantly affected by the effective modelled domain width in case this is not exactly 100m. Participants are reminded to ensure that the effective domain width is 100m (in this test only an alternative is to multiply the inflow discharge by the appropriate ratio if the effective width is not 100m).

Participants are asked to provide model results **at least** for the grid resolution specified above.

Model results for one alternative resolution or mesh may also be provided.

Participants are asked to justify their reasons for not carrying out the test, or for carrying out the test using an alternative resolution.