Test 8A – Rainfall and point source surface flow in urban areas

1. Modelling performance tested

This tests the package's capability to simulate shallow inundation originating from a point source and from rainfall applied directly to the model grid, at relatively high resolution.

2. Description

The modelled area is approximately 0.4 km by 0.96 km and covers entirely the DEM provided and shown in Figure (a). Ground elevations span a range of ~21m to ~37m.

The flood is assumed to arise from two sources:

- a uniformly distributed rainfall event illustrated by the hyetograph in Figure (b). This is applied to the modelled area only (the rest of the catchment is ignored).

- a point source at the location represented in Figure (a), and illustrated by the inflow time series in Figure (c). (This may for example be assumed to arise from a surcharging culvert.)

The DEM is a 0.5m resolution Digital Terrain Model (no vegetation or buildings) created from LiDAR data collected on 13th August 2009 and provided by the Environment Agency (http://www.geomatics-group.co.uk).

Participants are expected to ignore any buildings at the real location (Cockenzie Street and surrounding streets in Glasgow, UK) and to carry out the modelling using the "bare-earth" DEM provided.

A land-cover dependent roughness value is applied, with 2 categories: 1) Roads and pavements; 2) Any other land cover type.

The model is run until time T = 5 hours to allow the flood to settle in the lower parts of the modelled domain.

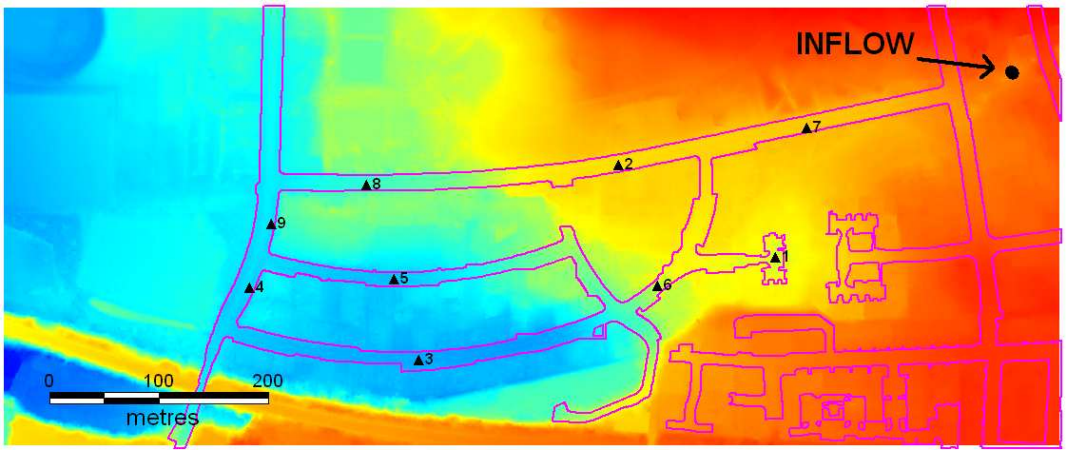

Figure (a): DEM used, with the location of the point source. Purple lines: outline of roads and pavements. Triangles: output point locations.

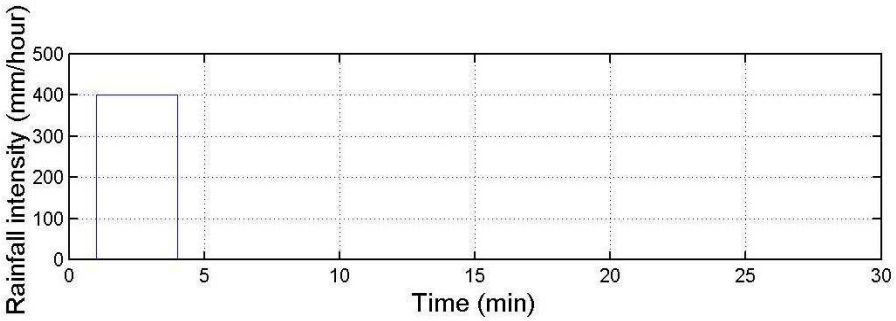

Figure (b): Hyetograph applied in Test 8A.

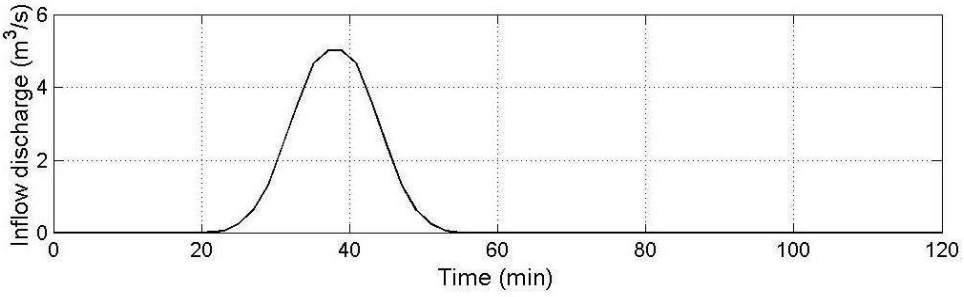

Figure (c): Inflow hydrograph applied in Test 8A at point location shown in Figure (a).

3. Boundary and initial conditions

Rainfall as described above. Hyetograph provided as table in dataset.

The point source is applied as described above. Coordinates and time series provided as part of dataset.

All boundaries of the modelled area are closed (no flow).

Initial condition: Dry bed.

4. Misc. parameter values

Manning's n: **0.02** for roads and pavements

0.05 everywhere else

Model grid resolution: **2m**

(or ~97000 nodes in the 0.388 km^2 area modelled)

Time of end: the model is to be run until time t = 5 hours (if an alternative end time is used run times must be reported for t=5 hours)

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.

Raster grids (or TIN) at the model resolution consisting of:

a. Peak **water level elevations** reached during the simulation
b. Peak water **depths** reached during the simulation

Water level elevation and **Velocity** versus time (output frequency 30s), at locations shown in Figure (a) and provided as part of the dataset.

6. Dataset content

Description	File Name
Georeferenced Raster ASCII DEM at resolution 0.5m	Test8DEM.asc
Rainfall hyetograph (rainfall intensity vs. time)	Test8A-rainfall.csv
Point source boundary condition table (inflow vs. time)	Test8A-point-inflow.csv
Point source coordinates	Test8A-inflow-location.csv
Location of output points	Test8Output.csv
Outline of roads and pavements (shapefile polygons)	Test8Road_Pavement_polyg_region
Outline of roads and pavements (ASCII raster file)	Test8RoadPavement.asc

7. Additional comments

The location modelled is in the City of Glasgow, UK (Cockenzie Street and surrounding streets)

Linear interpolation should be used to interpolate inflow values and rainfall intensity values.

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.