GUIDANCE ON "SWMM"

Software and Manuals

The U.S. Environmental Protection Agency's Storm Water Management Model (SWMM) is a comprehensive computer model for simulating hydrological and hydraulic processes in terms of the quantity and quality of urban runoff (Rossman 2015). The software is capable of simulating both single events and continuous sequences of rainfall.

The runoff component of SWMM operates on a collection of subcatchment areas that receive precipitation and generate runoff and pollutant loads. The routing portion of SWMM transports this runoff through a system of pipes, channels, storage/treatment devices, pumps, and regulators. SWMM tracks the quantity and quality of runoff generated within each subcatchment, and the flow rate, flow depth, and quality of water in each pipe and channel during a simulation period comprised of multiple time steps.

SWMM, both software and manuals, can be downloaded from www.epa.gov/water-research/storm-water-management-model-swmm. From that site, you should download:

- Self-extracting installation program for SWMM 5.1.104 (released 18 Feb 2020); and
- SWMM 5.1 User's Manual.

While other reference material and software is available at that site, these items are not required for your assignment.

Application

For the purposes of the assignment in 49256, the SWMM5 datafile provided can be assumed to be a calibrated file. To undertake the design flood estimation exercise, you need to determine the design flow in "Link 116"; this link is the location of the gauging station used in Assignment 1.

Operation of SWMM5 is possible through two alternate methods; these are

- Windows – With this form, the model is operated via GUIs. Once simulation is complete, output is via the graphical interface. However, text files of predictions can be obtained.
- Text file – With this form, the model is operated via a DOS window. Simulation output is directly to text files.

The input file is the same for both modes of operation. Only two segments of the input file provided to you require modification. These segments are:

- Header block – you may need to change the duration of the simulation period to ensure your storm events pass through the system. Note that when you change the dates and times, the date format is U.S. style (i.e. MM/DD/YY).

```
[TITLE]
;;Project Title/Notes
APPLICATION OF STORM WATER MANAGEMENT MODEL (SWMM)
POWELLS CREEK SIMULATION


[OPTIONS]
;;Option             Value
FLOW_UNITS           CMS
INFILTRATION         HORTON
FLOW_ROUTING         KINWAVE
LINK_OFFSETS         DEPTH
MIN_SLOPE            0
ALLOW_PONDING        NO
SKIP_STEADY_STATE    NO

START_DATE           10/07/1997
START_TIME           08:32:00
REPORT_START_DATE    10/07/1997
REPORT_START_TIME    08:32:00
END_DATE             10/08/1997
END_TIME             04:32:00
SWEEP_START          01/01
SWEEP_END            12/31
DRY_DAYS             0
REPORT_STEP          00:01:00
WET_STEP             00:00:15
DRY_STEP             00:00:15
ROUTING_STEP         0:00:15

INERTIAL_DAMPING     PARTIAL
NORMAL_FLOW_LIMITED  SLOPE
FORCE_MAIN_EQUATION  H-W
VARIABLE_STEP        0.75
LENGTHENING_STEP     0
MIN_SURFAREA         12.566
MAX_TRIALS           8
HEAD_TOLERANCE       0.0015
SYS_FLOW_TOL         5
LAT_FLOW_TOL         5
MINIMUM_STEP         0.5
THREADS              1
```

Start & End Dates

Figure 1. Header Block Sample

- Rain Block – this segment of the file is where you enter the design hyetographs. Dates are U.S. style. Note that the rainfall you enter against a time is the rainfall in the period to the next record; hence all hyetographs should end with a zero rainfall.

```
[TIMESERIES]
;;Name            Date       Time       Value
;;--------------- ---------- ---------- ---------
Rainseries1       10/7/1997  8:02       0.0000
Rainseries1       10/7/1997  8:07       0.0000
Rainseries1       10/7/1997  8:12       0.0000
Rainseries1       10/7/1997  8:17       0.0000
Rainseries1       10/7/1997  8:22       0.0000
Rainseries1       10/7/1997  8:27       0.0000
Rainseries1       10/7/1997  8:32       0.2000
Rainseries1       10/7/1997  8:37       0.6000
Rainseries1       10/7/1997  8:42       0.4000
Rainseries1       10/7/1997  8:47       0.4000
Rainseries1       10/7/1997  8:52       0.2000
Rainseries1       10/7/1997  8:57       0.2000
Rainseries1       10/7/1997  9:02       0.2000
Rainseries1       10/7/1997  9:07       0.4000
Rainseries1       10/7/1997  9:12       0.4000
Rainseries1       10/7/1997  9:17       0.2000
Rainseries1       10/7/1997  9:22       0.2000
Rainseries1       10/7/1997  9:27       0.0000
Rainseries1       10/7/1997  9:32       0.0000
Rainseries1       10/7/1997  9:37       0.2000
Rainseries1       10/7/1997  9:42       0.0000
Rainseries1       10/7/1997  9:47       0.0000
Rainseries1       10/7/1997  9:52       0.0000
Rainseries1       10/7/1997  9:57       0.0000
Rainseries1       10/7/1997 10:02       0.2000
Rainseries1       10/7/1997 10:07       0.0000
```

Figure 2. Rain Segment Sample

In the rain block, it is possible to combine all 10 patterns for a duration into a single file provided there is a dry period between the events. I would suggest that you use a 3 hour period for that purpose. When you use this approach, you will need to interrogate the output file to ascertain the peak discharges for each of the hyetographs; the software will only provide the maximum discharge over the total storm period (i.e. the duration required for the 10 rain bursts and the 10 dry periods).