

Name: _____

CVEN 339 – Water Resources Engineering
Summer Semester 2007
Dr. Kelly Brumbelow, Texas A&M University

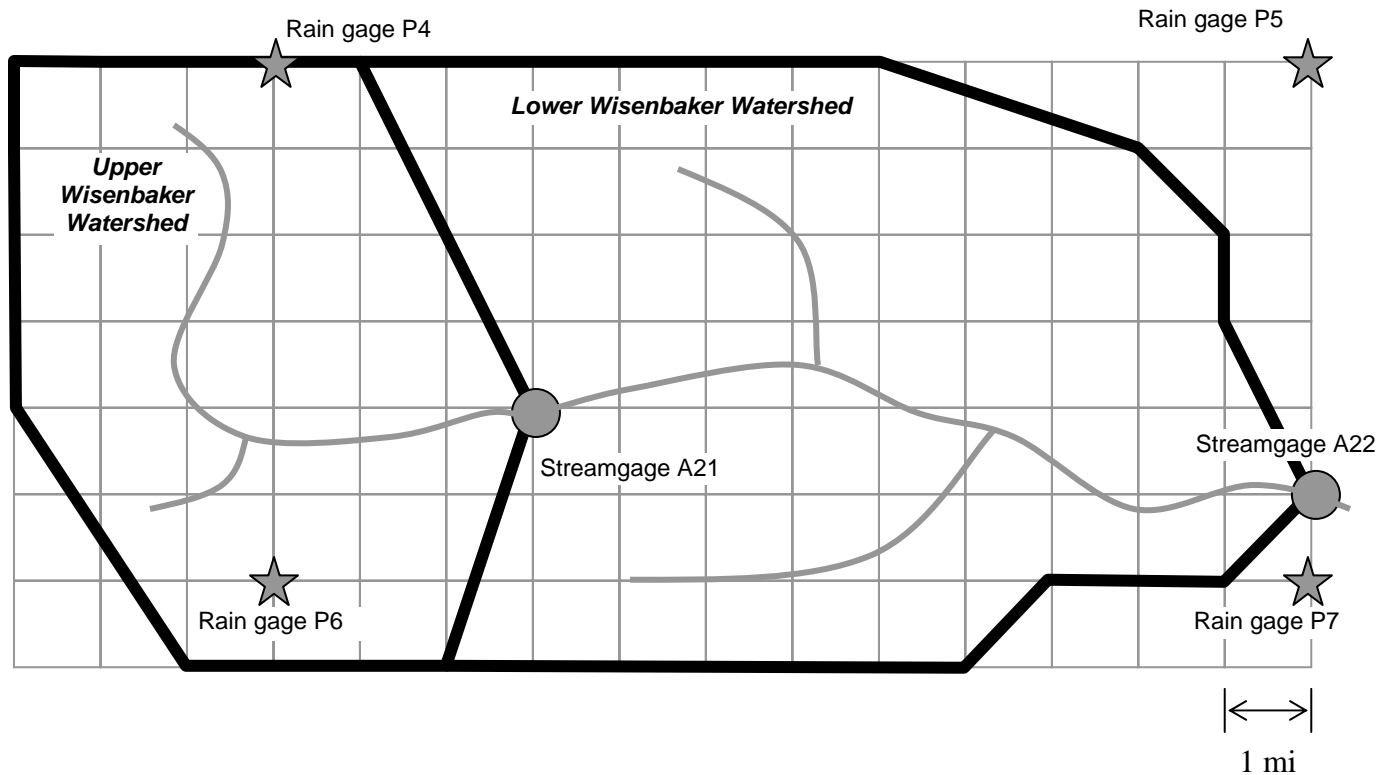
Exam #2

Open-book, Open-notes (5 pages, 2 questions); Time allowed: 80 minutes

1. Two adjacent watersheds are mapped to scale below. The two watersheds are linked by the Wisenbaker River, which flows west to east. The boundary between the two watersheds is determined by the location of streamgage A21 – this gage is located at the outlet of the Upper Wisenbaker watershed. Four precipitation gages are located in the vicinity and are indicated by stars in the map.

The local flood control agency has a runoff model for these watersheds based on the NRCS Curve Number method. Of particular importance in this model is the AMC prior to any storm. The agency uses a water balance model to estimate water stored as soil moisture in each watershed, and the storage is linked to AMC as shown in the table below. The water balance model works at a weekly time-step. Groundwater is not considered in the water balance model. A Thiessen polygon approach is used to determine MAP for each watershed each week.

Given below is observed data at precipitation and streamflow gages. The estimated storage values in the Upper Wisenbaker and Lower Wisenbaker watersheds are 30,373 and 27,600 acre-feet, respectively, on June 1st. Determine the storage and AMC values for each watershed on June 8th and 15th. (50 points)



Storage ranges (acre-feet) corresponding to AMC values for each watershed.

Antecedent Moisture Condition	Upper Wisenbaker	Lower Wisenbaker
AMC-I	0 – 14293	0 – 24533
AMC-II	14293 – 28587	24533 – 49067
AMC-III	> 28587	> 49067

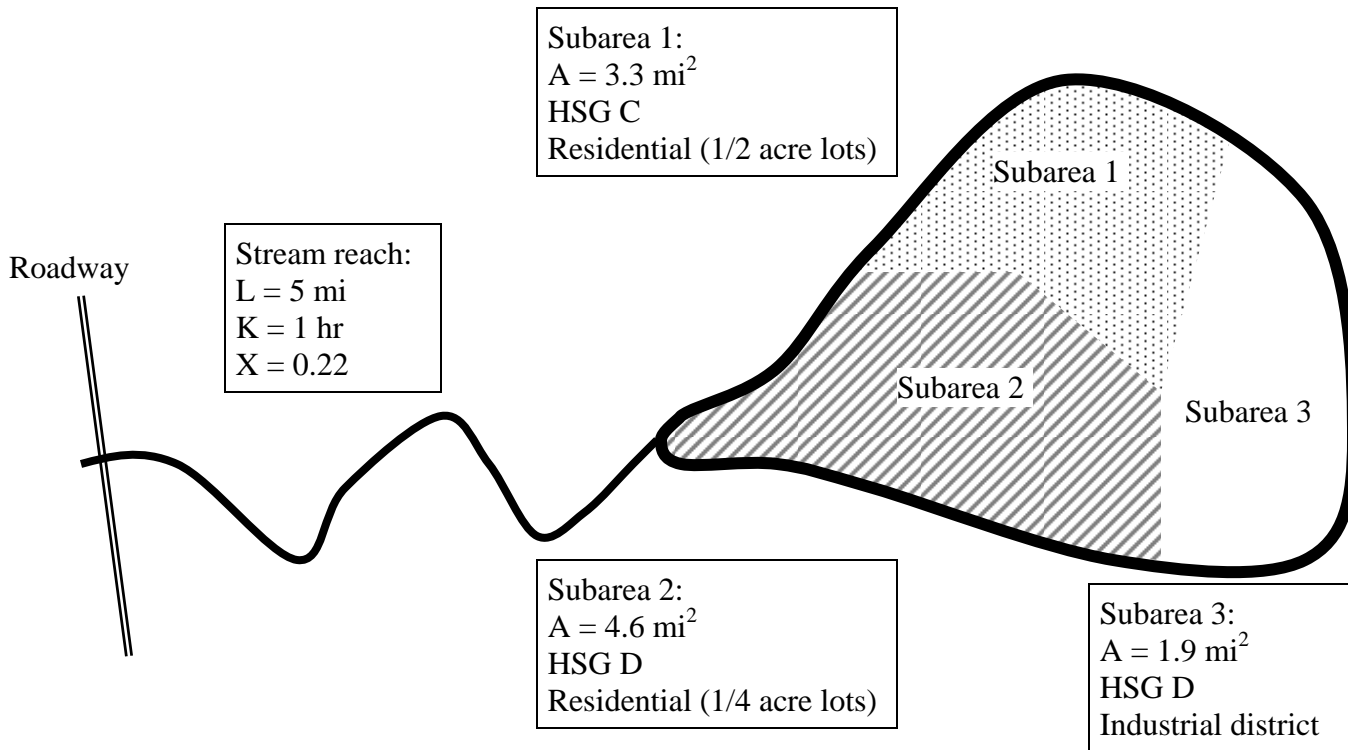
Weekly observed hydrologic data.

Measurement	June 1-7	June 8-14
Rain gage P4 (in)	0.50	0
Rain gage P5 (in)	0.35	0.1
Rain gage P6 (in)	0.44	0
Rain gage P7 (in)	0.24	0.15
Stream gage A21 (cfs)	663	432
Stream gage A22 (cfs)	1080	720
Evapotranspiration* (in)	0.41	0.76

*Evapotranspiration value applies to both watersheds.

(Work space for #1)

2. A severe thunderstorm falls on the watershed sketched below (not to scale). The storm rains 4.65 inches in 2 hours. As indicated in the drawing, there is some variation in soil types and land cover on the watershed. Downstream of the watershed outlet no rain falls, and the streamflow leaving the watershed continues down a 5 mile long channel before reaching a culvert under a major roadway. *What will be the peak streamflow value at the culvert, and how long after the beginning of the thunderstorm will it occur?* (50 points)



The watershed as a whole has hydraulic length = 6.2 miles and average land slope = 0.016.

(Work space for #2)