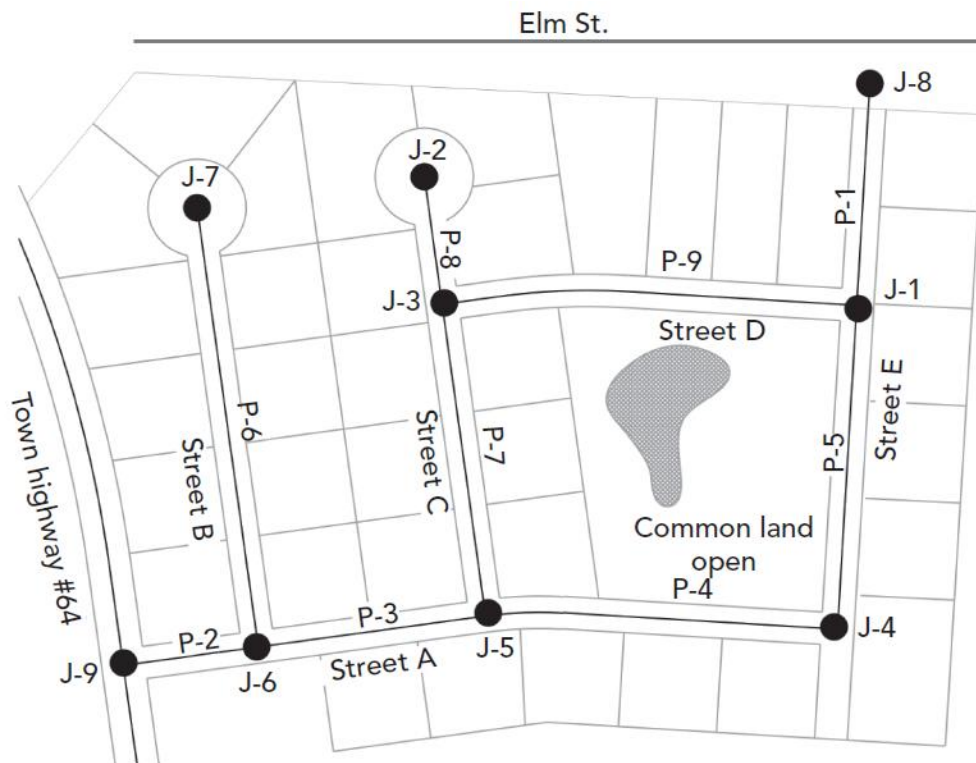


Fundamentals of Water Distribution Modeling and Design.

Problem Statement

A subdivision of 36 homes is being constructed in a new area of town. Each home will require 1.7 l/s during peak periods. All junction nodes are 192 m in elevation. All pipes are ductile iron ($C = 130$, use the Hazen–William’s equation to determine the friction losses in the pipe). The current lot and network layout is shown below.



Schematic for the Problem

Junction and Pipe Information for Problem

Junction Label	Number of Lots Serviced
J-1	5
J-2	4
J-3	4
J-4	5
J-5	6
J-6	6
J-7	6

Pipe Label	Length (m)	Diameter (mm)
P-1	60.0	150
P-2	60.0	150
P-3	110.5	150
P-4	164.0	150
P-5	152.5	150
P-6	204.0	100
P-7	148.0	150
P-8	61.0	100
P-9	194.0	150

Currently, a model of the entire water system does not exist. However, hydrant tests were conducted using hydrants located on two water mains, one in Town Highway 64 and the other in Elm Street. The following data were obtained:

Town Highway 64 Hydrant Test

Static pressure 310.3 kPa

Residual pressure 98.5 kPa at 32 l/s

Elevation of pressure gauge 190 m

Elm Street Hydrant Test

Static pressure 413.7 kPa

Residual pressure 319.3 kPa at 40 l/s

Elevation of pressure gauge 191.5 m

Tasks to perform:

The subdivision will connect to existing system mains in these streets at nodes J-8 and J-9. (Hint: Model the connection to an existing water main with a reservoir and a pump.)

- What are the demands at each of the junction nodes? What is the total demand?
- Does the present water distribution system have enough capacity to supply the new subdivision?
- Which connection to the existing main is supplying more water to the subdivision? Why?

(d) Are the proposed pipe sizes adequate to maintain velocities between 0.15 and 2.44 m/s, and pressures of at least 140 kPa?

(e) Would the subdivision have enough water if only one connection were used? If so, which one?

(f) What do you think are some possible pitfalls of modeling two connections to existing mains within the same system, as opposed to modeling back to the water source?

Reference Materials.

Software Download – WaterGEMS

[Fundamentals of Water Distribution Modeling and Design](#)

Datasets and Workbook are included in the Guided Learning Path.

[Computer Application in Hydraulic Engineering, 9th Edition](#)