CHAPTER 6

DISTRIBUTION OF WATER: RESERVOIRS, CAPACITY AND LOCATION

1. **Functions**:

A. Distribution reservoirs provide storage for:

i. Operating storage: to meet demands in excess of the max daily flow, required by the distribution systems at peak periods. Since water treatment plant, water intake structures and pumping stations are designed for max daily flow, demands on the system in excess of this rate must be met by storage.

ii. Fire storage: storage should provide fire flows:
-12 hrs in large communities
- > 2hrs in small communities

iii. Emergency storage: calculated by multiplying the max daily demand by a factor, K:
K = 0.50 for Turkey
K = 1.0 for Germany
K = 2.0 for Germany long transmission line
K = 3.0 for USA

B. To provide operating pressure. The service reservoir should be located such that it should provide the required pressure at every point in the distribution system.

2. Types of Reservoirs:

i. Surface reservoirs (underground type)
ii. Elevated reservoirs (water tower)

2.1. According to plan:

In general, service reservoirs can be:

- rectangular or square

- circular

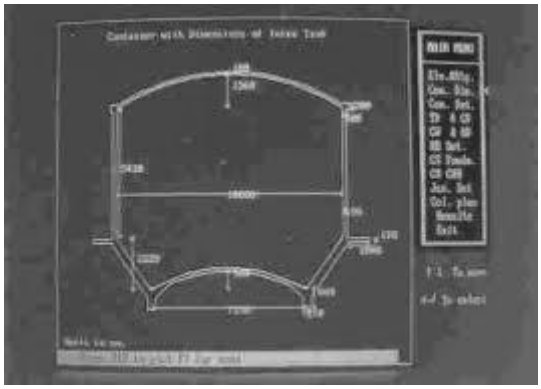

Figure 1. Intze shaped bottom [1].

Figure 2. Flat bottom shaped water tower [2].

- Water towers can be made of concrete or steel. The most suitable form for concrete towers is a cylinder with an intze shaped bottom or with a flat bottom. Steel tanks may have a spherical or dome shaped bottom.

Figure 3. Spherical shaped bottom water tower [3].

Figure 4. Dome shaped bottom water tower [4].

- The lowest water level in the tank is determined according to the pressure requirement in the distribution system, which may vary from 15m to 50m of water, depending on the type of community and the pressure requirement in the different areas of a city.

- In order to keep pumping cost minimum, the depth of water in the tank is generally kept small.

- Due to structural considerations, the depth is kept equal to the diameter. For circular tanks, the following formulae for the diameter can be used:

Water tower volume (m^3)	Diameter of the water tower (m)
100 - 500	5 + Volume/100
500 - 1000	8 + Volume/250

2.2. According to the location:

a) Central: the service reservoir is located in the center of the distribution system.

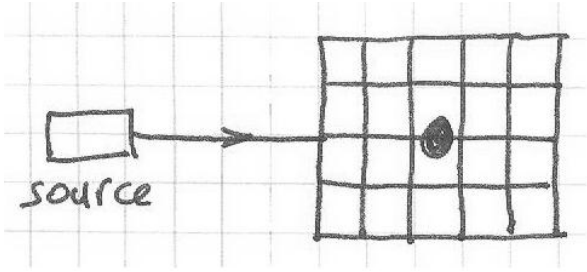

Figure 5. Reservoir at the center of the city

b) At the side:

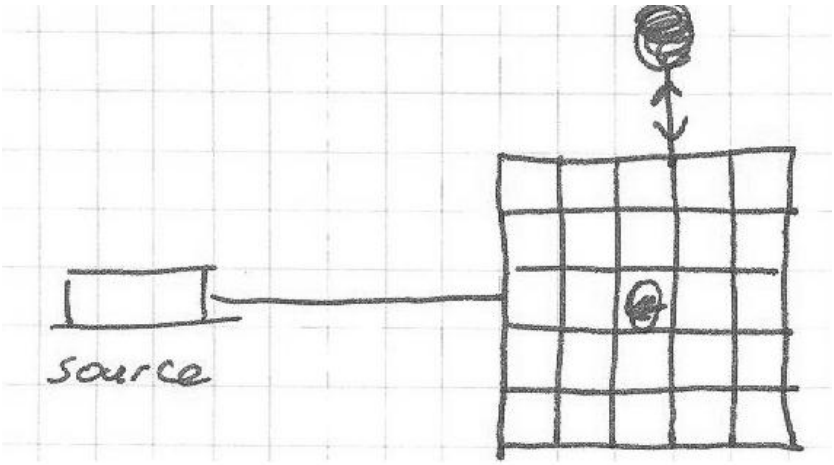

Figure 6. Reservoir at the side of the city.

c) Between the network and the source:

All the water must pass through the elevated tank before flowing to the distribution system.

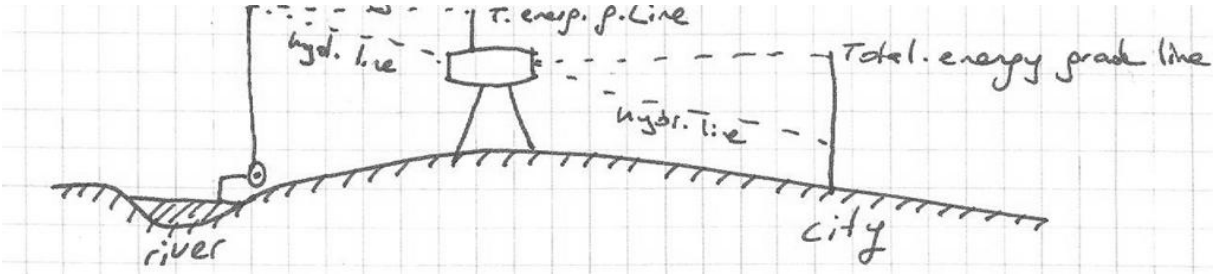

Figure 7. Reservoir between the network and the city.

When water is supplied from an impounded high level reservoir, the service reservoir also serves to reduce the high pressure of water.

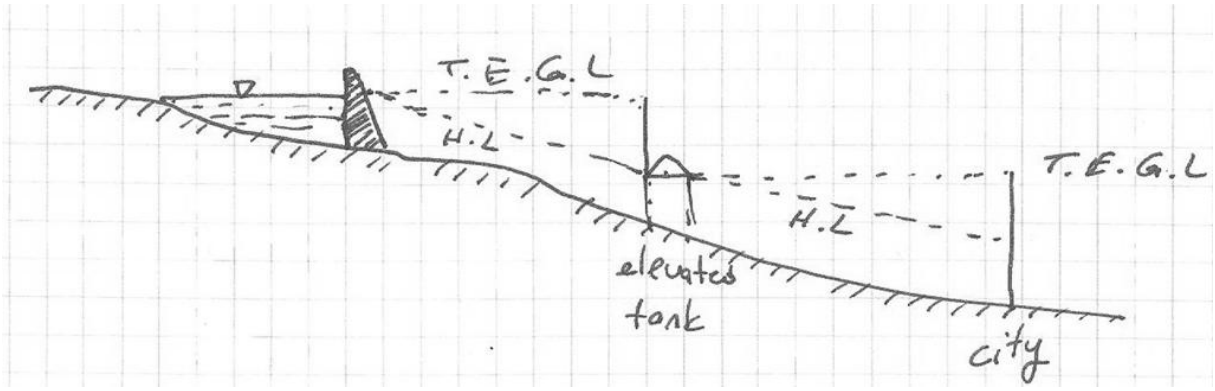

Figure 8. Reservoir between the network and the city decreasing the pressure.

d) At the opposite end of the network:

In this case, most of the requirements are met by direct pumping and the excess water flows to the service reservoir.

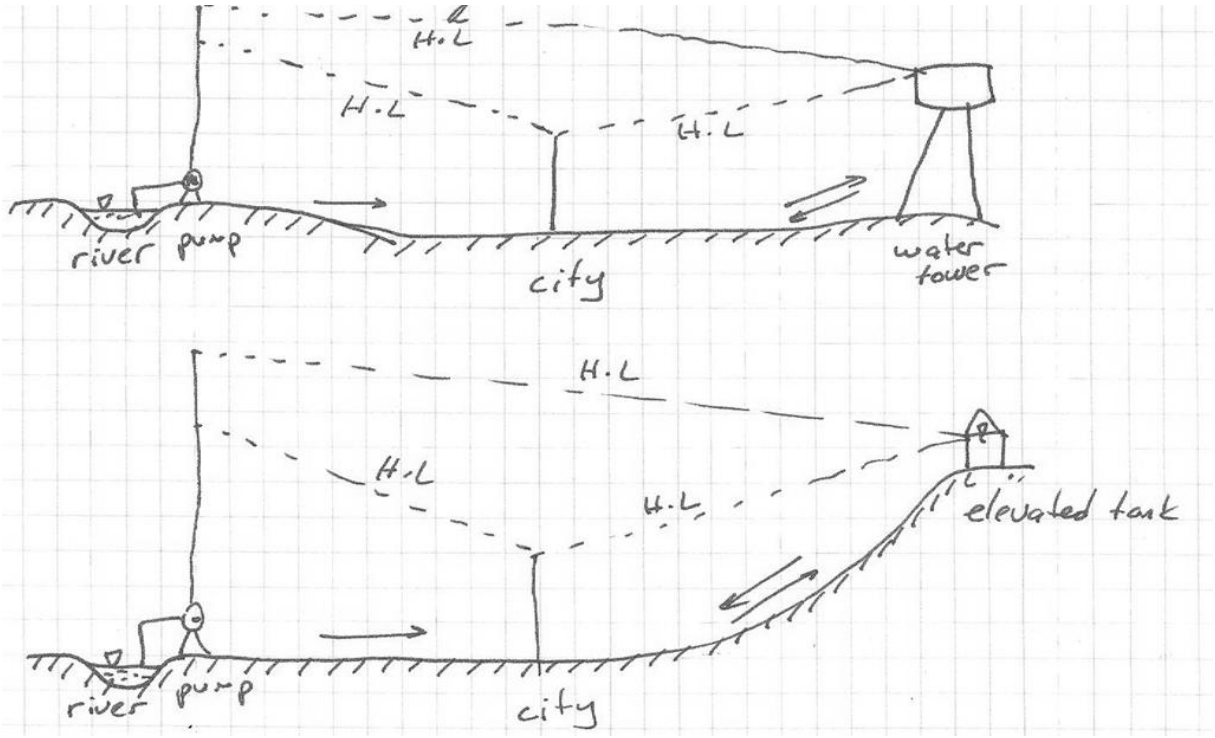

Figure 9. Reservoir at the opposite end of the network.

[1] www.sercm.org

[2] http://kottke.org/tag/architecture

[3] http://www.worldstallestwatersphere.com/?paged=2

[4] http://www.geocaching.com/mark/details.aspx?PID=DG3172