CE 3372 – Water Systems Design
Exercise Set 6

Purpose:	Demonstrate flow-equalization volume required for a storage tank to leverage some constant flow rate.
Task(s):	Analyze daily water cumulative demand (from time varying outflows) Find equivalent constant draw rate Use double mass curve concept to find maximum deviations to size an equalization tank.

Exercise

1. Figure 1 is a plot of variable cumulative inflow volume versus time for a proposed flow-equalization tank location and the equivalent constant rate inflow for the same location.

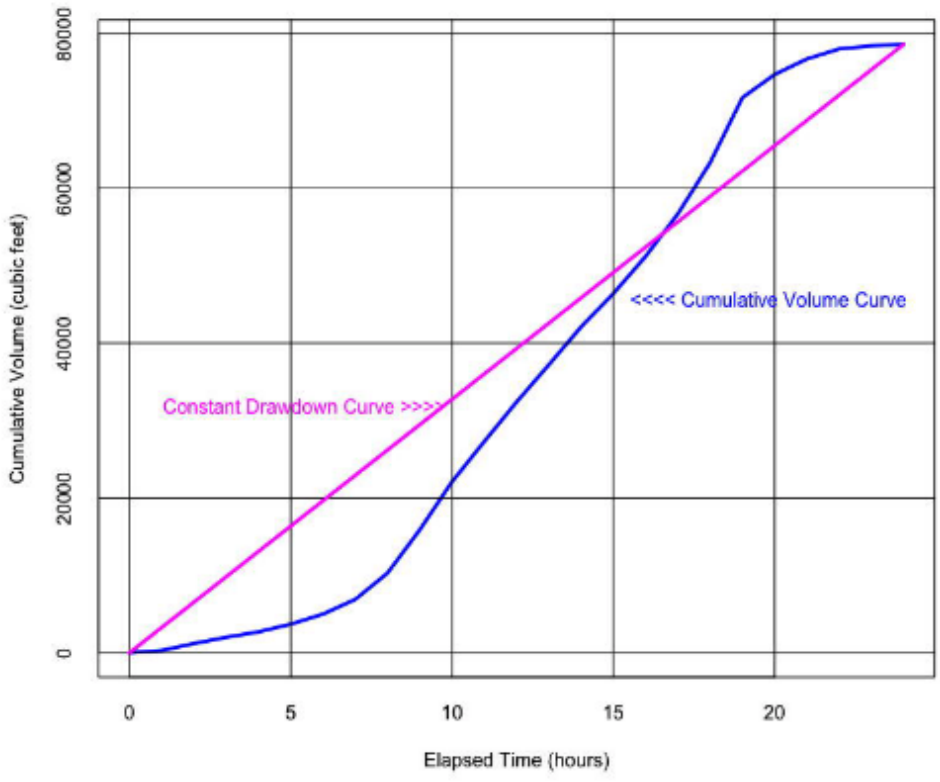

Figure 1: Time-varying water demand (cumulative) and constant-rate equivalent demand

Figure 2 is a list of time and cumulative volume inflow (same as the graph). A flow-equalization storage tank volume is to be determined.

Hour	Cum. Vol. (ft^3)	Hour	Cum. Vol. (ft^3)
0	0	–	–
1	300	13	37,200
2	1,200	14	42,100
3	2,000	15	46,400
4	2,700	16	51,200
5	3,700	17	56,700
6	5,000	18	63,300
7	6,900	19	71,700
8	10,300	20	74,700
9	15,900	21	76,700
10	22,100	22	78,000
11	27,300	23	78,400
12	32,400	24	78,600

Figure 2: Variable Draft Table for Flow Equalization

Determine:

(a) The cumulative volume of inflow (or draft) every 24 hours plotted on Figure 1 and tabulated in Figure 2.

(b) The constant flow rate (cubic feet per hour) from the constant drawdown curve plotted on Figure 1 and tabulated in Figure 2.

(c) The largest maximum absolute deviation between the constant drawdown line and the variable inflow curve indicated by Figure 1 and/or tabulated in Figure 2.

(d) The second largest maximum absolute deviation between the constant drawdown line and the variable inflow curve indicated by Figure 1 and/or tabulated in Figure 2.

(e) A recommended flow equalization storage volume indicated by Figure 1 and/or tabulated in Figure 2.

References

Gupta, R. S. 2017. Hydrology and Hydraulic Systems. Waveland Press, Inc. pp. 548-552