EXAMPLE 1.8

STREAMFLOW MEASUREMENT

Given the stream section shown in Fig. E1.8 and the following measurements, calculate the total discharge and the average velocity throughout the section.

MEASUREMENT STATION	DISTANCE ACROSS STREAM (ft)	WIDTH ΔW (ft)	DEPTH D (ft)	MEAN VELOCITY v (ft/sec)	AREA $\Delta W \cdot D$	DISCHARGE (cfs)
A	0	7	0	0	0	0.00
B	14	13	1.1	0.43	14.3	6.15
C	26	12	2.6	0.61	31.2	19.03
D	38	11.5	3.5	1.54	40.25	61.99
E	49	11.5	3.2	1.21	36.8	44.53
F	61	14.5	3.1	1.13	44.95	50.79
G	78	17	3.9	1.52	66.3	100.78
H	95	18	4.2	2.34	75.6	176.90
I	114	19	3.3	1.42	62.7	89.03
J	133	19	2.9	1.34	55.1	73.83
K	152	19	2.1	1.23	39.9	49.08
L	171	19	1.4	0.53	26.6	14.10
M	190	9.5	0	0	0	0.00
		Sum = 190 ft			493.7 ft^2	686 cfs
			Average Velocity = 1.4 ft/s			
			Total Discharge = 686 cfs			

Solution The distance represents the distance along the top of the stream. The depth and the velocity are measured directly in the field. The distance points mark the middle of each width division across the stream; accordingly, the width is measured as halfway to the next station and halfway back to the previous station. For example, for station F,

$$\Delta W = 0.5 \times (61 - 49) + 0.5 \times (78 - 61) = 14.5.$$

The discharge is then calculated as the depth times the width times the mean velocity summed across the stream:

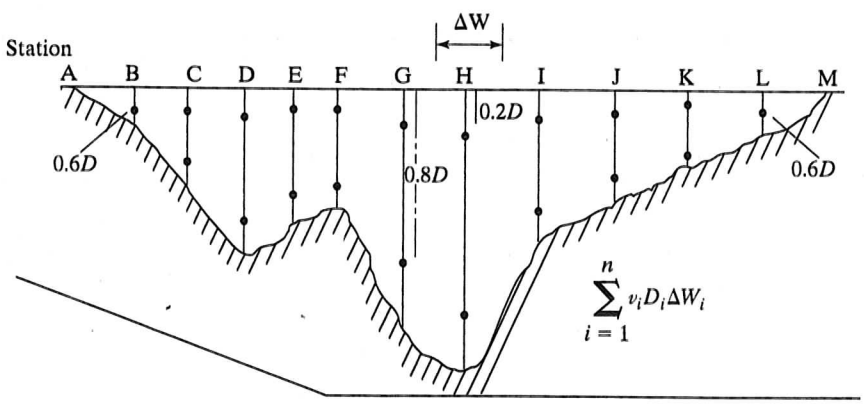

Figure E1.8

$$Q_i = \sum_{i=1}^{n} (\Delta W_i \times D_i \times v_i) = 686 \text{ cfs}.$$

SOURCE: Bedient, P. B. & W. C. Huber Hydrology & Floodplain Analysis Prentice Hall, 2002