Secondary Eff. BOD=[Influent BOD * (1-Primary BOD Removal)]*(1-Secondary BOD Removal)

Therefore, 20 = [X*(1-0.35)] * (1-0.85)= X*0.65*0.15

$$\implies 20\ \frac{mg}{l} = 0.0975X \implies X = \frac{20}{0.0975} = \boxed{205\ \frac{mg}{l}}$$

4.6 Preliminary Treatment Calculations

4.6.1 Channel Velocity and Flow Rate

Flow Rate - Q (volume/time) = velocity (distance or length traveled /time) * surface area

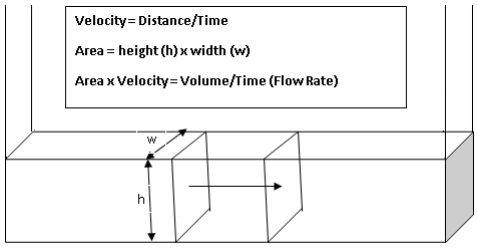
Velocity is the speed at which the water is flowing. It is measured in units of length/time – ft./sec. Velocity of water flowing through can be calculated by dividing the flow rate by area of the flow stream.

$$Velocity\ \frac{length}{time} = \frac{flow\ rate(\frac{volume\ or\ cubic\ length}{time})}{surface\ area\ in\ the\ direction\ of\ flow - square\ length}$$

For a flow in a channel:

Example Problems:

1. Calculate the velocity of a 14 MGD flow in a 6 ft wide channel with a water depth of two feet.



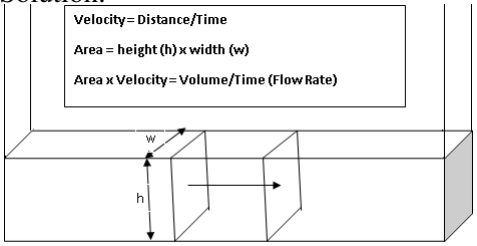
$$Flow(Q) = Velocity(V) * Area(A)$$

$$\implies 14\frac{MG}{day} * \frac{10^6 gal}{MG} * \frac{ft^3}{7.48 gal} * \frac{day}{24*60*60} = V\frac{ft}{sec} * 6ft * 2ft \implies 21.7\frac{ft^3}{sec} = 12V\frac{ft^3}{sec}$$

$$\implies V\frac{ft}{sec} = \frac{21.7}{12} = \boxed{1.8\frac{ft}{sec}}$$

2. Calculate the flow, in gpd, that would pass through a grit chamber 2 feet wide, at a depth of 6 inches, with a velocity of 1 ft /sec

Solution:



$$Q = V * A$$