



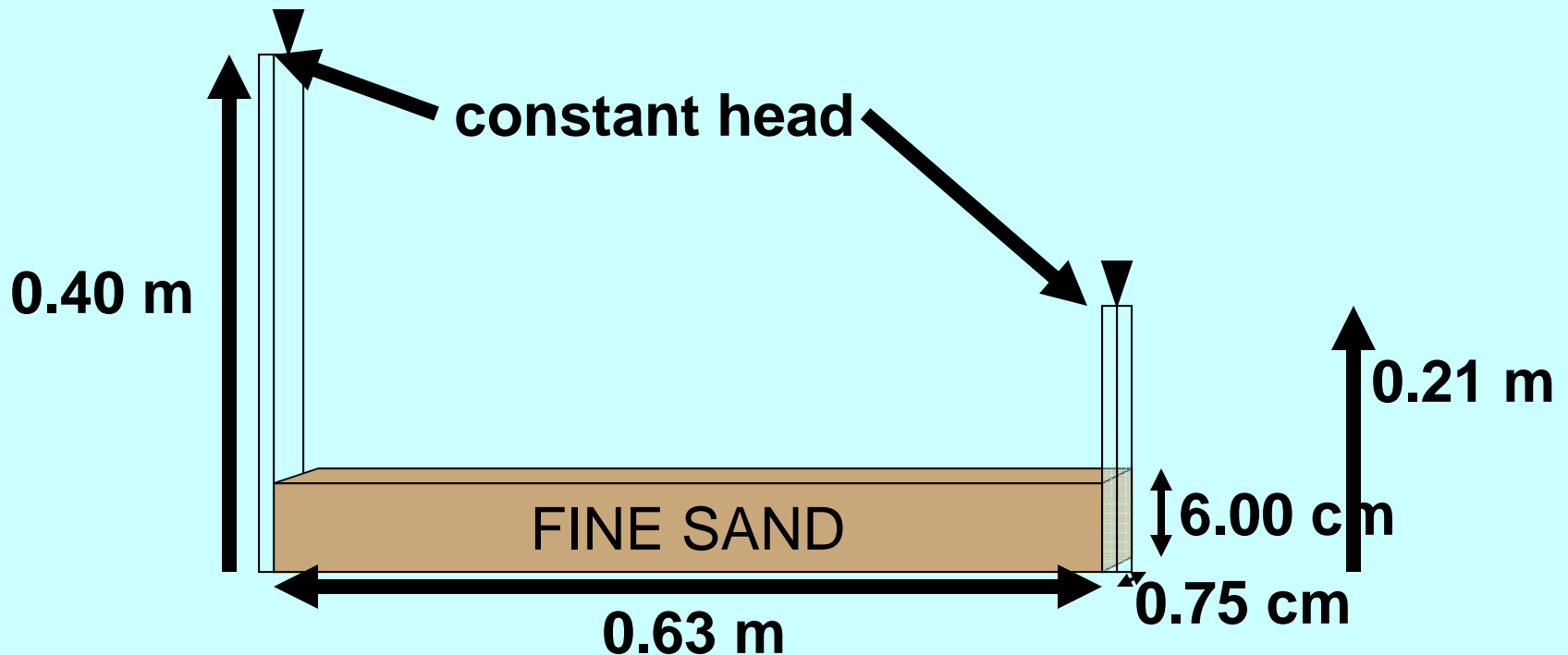
$$Q = K \frac{\text{Head Difference}}{\text{Distance between Heads}} \text{Area}$$

~0.014cm³/sec? how about liters? days?

$$Q = \frac{0.01 \text{ cm}}{\text{sec}} \frac{0.19 \text{ m}}{0.63 \text{ m}} \frac{6 \text{ cm}}{0.75 \text{ cm}} \frac{1 \text{ liter}}{1000 \text{ cm}^3} \frac{86400 \text{ sec}}{\text{day}} = 1.17 \frac{\text{liter}}{\text{day}} = 1.2 \frac{\text{liter}}{\text{day}}$$

Might vary up and down and order of magnitude significant figures?

http://en.wikipedia.org/wiki/Hydraulic_conductivity#Ranges_of_values_for_natural_materials



Converting Units

3.6 feet >> to >> inches?

feet * 12 = inches

$$3.6 \cancel{\text{feet}} * \frac{12 \text{ inches}}{1 \cancel{\text{feet}}} = 43 \text{ inches}$$

3.6 cms = cubic meters per second ... to ... LPM = liters per minute?

cms * ?

you may know some relationships and take a long route

$$3.6 \frac{\cancel{\text{m}^3}}{\cancel{\text{sec}}} * \frac{\cancel{100} \cancel{\text{cm}}}{\cancel{1} \cancel{\text{m}}} * \frac{\cancel{100} \cancel{\text{cm}}}{\cancel{1} \cancel{\text{m}}} * \frac{\cancel{100} \cancel{\text{cm}}}{\cancel{1} \cancel{\text{m}}} * \frac{\cancel{1} \cancel{\text{ml}}}{\cancel{1} \cancel{\text{cm}^3}} * \frac{\cancel{1} \cancel{\text{liter}}}{\cancel{1000} \cancel{\text{ml}}} * \frac{\cancel{60} \cancel{\text{sec}}}{\cancel{1} \cancel{\text{min}}} =$$
$$= 216,000 \frac{\text{liter}}{\text{min}} \quad \sim 220,000 \frac{\text{liter}}{\text{min}}$$

OR:

$$3.6 \frac{\cancel{\text{m}^3}}{\cancel{\text{sec}}} * \frac{1000 \text{ liter}}{\cancel{1} \cancel{\text{m}^3}} * \frac{\cancel{60} \cancel{\text{sec}}}{\cancel{1} \cancel{\text{min}}} = \sim 220,000 \frac{\text{liter}}{\text{min}}$$

Get a “feel” for Units and Magnitudes

How many minutes do you manage each day?

1440 min
day

How many seconds each day?

86,400 sec
day

How many gallons are in a cubic foot?

7.48 ft³
gal

How much does a cubic foot of water weigh?

62.4 lbs
ft³

If you stand on the foot bridge over Clear Creek today,
how many cubic feet of water pass under you each second?

“google” : streamflow Clear Creek Golden CO

http://waterdata.usgs.gov/co/nwis/dv/?site_no=06719505&PARAMeter_cd=00060

How many gallons is that in a minute?

Large Volumes of Water are better understood in alternate units
Such as Acre-Feet

Work with someone nearby - Take 5 min to convert

5000 AFY = Acre feet per year > to > GPM Gallons per minute

Conversion books / Dictionary / Web Search

AFY * ? One source of information:

<http://www.unc.edu/~rowlett/units/dictA.html>

$$5000 \frac{\text{acre-ft}}{\text{yr}} * \frac{43560\text{ft}^2}{1 \text{ acre}} * \frac{7.48 \text{ gallons}}{1 \text{ ft}^3} * \frac{1 \text{ hr}}{60\text{min}} * \frac{1\text{day}}{24\text{hr}} * \frac{1 \text{ yr}}{365\text{day}}$$

~ **3000 gallon** or with **1440min** & **~200gal** enough for
min day home-day **~22,000 homes**

Handy Hydro Conversions:

$$\frac{7.48 \text{ gallons}}{1 \text{ ft}^3} \quad \frac{62.4 \text{ lb}}{1 \text{ ft}^3} \quad \frac{8.34\text{lb}}{1 \text{ gal}} \quad \frac{86,400\text{sec}}{1 \text{ day}} \quad \frac{1440 \text{ min}}{1 \text{ day}} \quad \frac{1 \text{ m}}{3.28\text{ft}}$$

ESTIMATE:

Flow from your kitchen faucet

Flow from your garden hose

Flow from a gasoline pump at a gas station

Flow in Clear Creek Today

ESTIMATE:

Flow from your kitchen faucet ~ 2-3 GPM

Flow from your garden hose ~ 2-5 GPM

Flow from a gasoline pump ~ 10 GPM

Flow in Clear Creek Today – what was it?