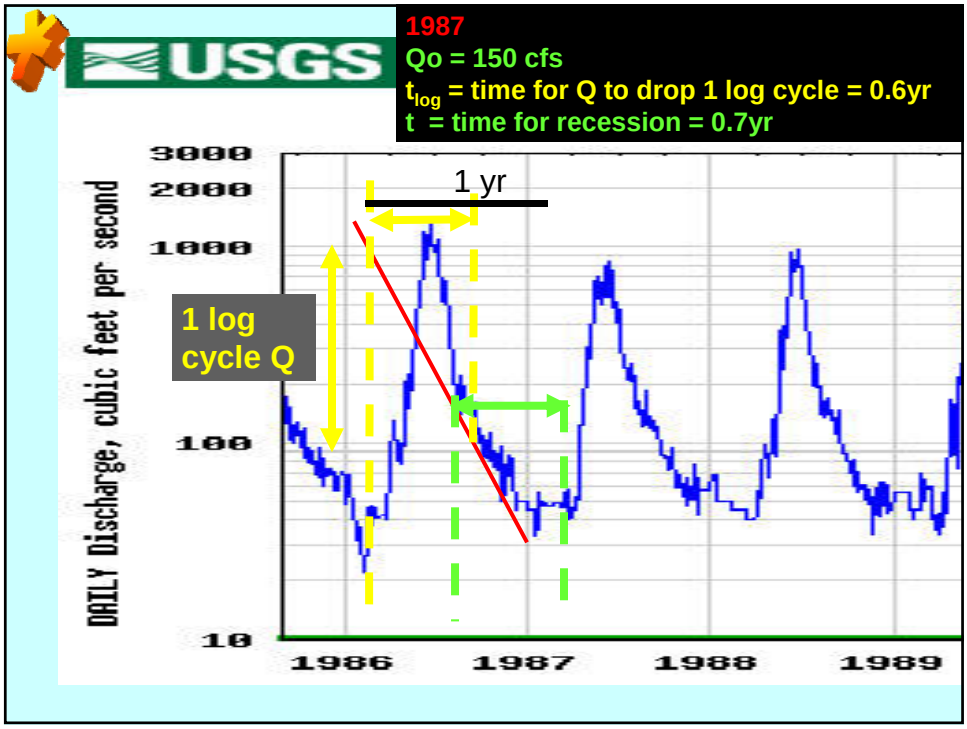


TOTAL GW THAT COULD DISCHARGE AT START OF RECESSION, V_{tp}:

$$V_{tp} \text{ is evaluated } \int_0^{\infty} \qquad V_{tp} = \frac{Q_o t_{\log}}{2.3}$$

NEED CONSISTENT UNITS

TOTAL GW THAT COULD DISCHARGE AT END OF RECESSION, V_R:

$$V_R \text{ is evaluated } \int_{t@end}^{\infty} \qquad V_R = \frac{Q_o t_{\log}}{2.3\left(10^{\frac{t}{t_{\log}}}\right)}$$

1987, 1988, 1989, 1993

Qo ~ 150 cfs

t_{log} = time for Q to drop 1 log cycle ~ 0.6 yr

t = time for recession ~ 0.7 yr

Vtp ~ 1.2×10^9 ft^3

V_R ~ 8.4×10^7 ft^3

Vdischarged ~ 1.2×10^9 ft^3 ~26,000 AF

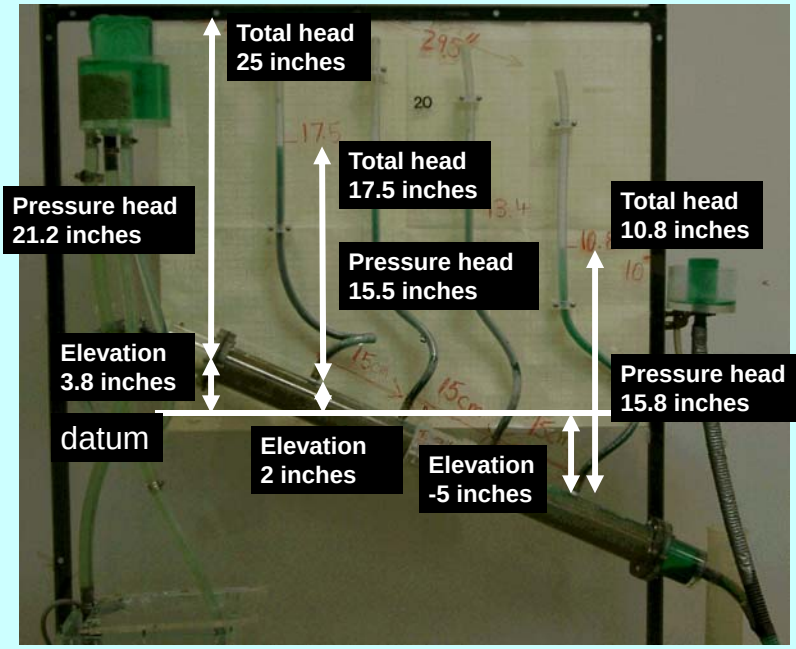
Q at end of recession is not used in equations

SAME EVERY YEAR

CONNECT LOW FLOWS

FROM Qo TO NEXT UP TURN

What are the elevation and pressure heads?



$$Q = KiA$$

$$K = \frac{Q}{iA}$$

$$K = \frac{\left[\dfrac{\text{Volume}\ \text{ml}\ \dfrac{1\text{cm}^3}{1\text{ml}}}{\text{time}\ \text{sec}}\right]}{\left[\dfrac{(h2 - h1)\text{in}}{\text{distance}\ \text{in}}\right]\left[\pi\left(\text{radius in}\ \dfrac{2.54\text{cm}}{\text{in}}\right)^2\right]} = \frac{XX\ \text{cm}}{\text{sec}}$$

Reasonable for sand?

$$V_{Darcy} = Ki = K\frac{dh}{dl}$$

$$V_{Interstitial} = \frac{Ki}{\phi} = \frac{K}{\phi}\frac{dh}{dl}$$

$$\phi = \frac{Ki}{V_{Interstitial}}$$

Reasonable for sand?

$$Q = KiA$$

$$K = \frac{Q}{iA}$$

$Q = \frac{1.5\,cm^3}{sec}$

$$K = \frac{\left[\frac{90\ ml\ \frac{1cm^3}{1ml}}{60\ sec}\right]}{\left[\frac{(17.5 - 10.8)in\ (2.54cm/in)}{(45cm)}\right]\left[\pi\left(1\ in\ \frac{2.54cm}{in}\right)^2\right]} = \frac{0.2\ cm}{sec}$$

Reasonable for sand?

$i = 0.37$

$A = 20cm^2$

Yes see:

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

Calculate Effective Porosity using data from Darcy Apparatus

What measurements will you need?

Travel time of a tracer through the sand = 30inch in 7 min

What equation will you solve?

$$\phi = \frac{V_{darcy}}{V_{tracer}} = \frac{Q = \frac{1.5\,cm^3}{sec}}{A = 20\,cm^2} = \frac{0.075\ cm/sec}{\frac{30\,in\ 2.54\,cm/in}{7\,min\ 60\,sec/min}} = \frac{0.075\ cm/sec}{0.18\ cm/sec} = 0.41$$

With a different gradient:

$Q = KiA$

$K = \frac{Q}{iA}$

$$K = \frac{Q = \frac{2.3\,cm^3}{sec}}{\left[\frac{140\ ml\ \frac{1cm^3}{1ml}}{60\ sec}\right]\left[\frac{(2.5)\,in}{(45cm)\ (1in/2.54cm)}\right]\left[\pi\left(1\ in\ \frac{2.54cm}{in}\right)^2\right]} = \frac{0.8\ cm}{sec}$$

Recall the sand has been removed and replaced since the prior measurements, so we do not expect the same value of K

Reasonable for sand?

i = 0.14

A = 20cm²

Yes see:

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

Calculate Effective Porosity using data from Darcy Apparatus

What measurements will you need?

Travel time of a tracer through the 30 inch tube = 300 sec

What equation will you solve?

$$\phi = \frac{V_{darcy}}{V_{tracer}} = \frac{Q = \frac{2.3\,cm^3}{sec}}{A = 20\,cm^2} = \frac{0.1\ cm/sec}{\frac{30\,in\ 2.54\,cm/in}{300\ sec}} = \frac{0.1\ cm/sec}{0.254\ cm/sec} = 0.39$$

With a our class gradient and Q:

$Q = KiA$

$K = \frac{Q}{iA}$

$$Q = \frac{2\,cm^3}{sec}$$

$$K = \frac{\left[\frac{120\ ml\ \frac{1\,cm^3}{1\,ml}}{60\ sec}\right]}{\left[\frac{(1)\,in}{(15\,cm)\ (1\,in/2.54\,cm)}\right]\left[\pi\,(1\ in\ \frac{2.54\,cm}{in})^2\right]} = \frac{0.7\ cm}{sec}$$

Reasonable for sand? Yes see:

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

i = 0.17

$A = 20\,cm^2$

Calculate Effective Porosity using data from Darcy Apparatus

What measurements will you need?

For the previous example with Q=2.3 cm3/sec

Travel time of a tracer through the 30 inch tube = 300 sec

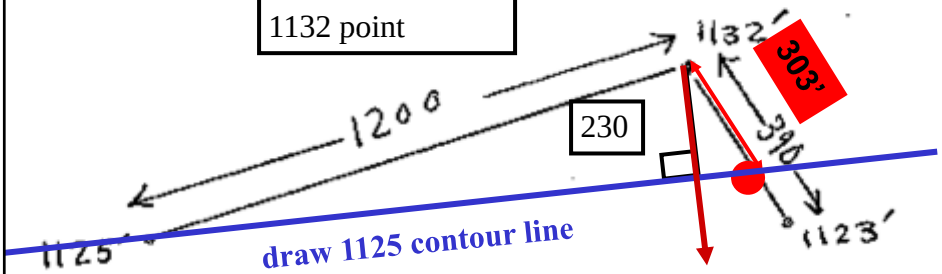
What equation will you solve?

$$\phi = \frac{V_{darcy}}{V_{tracer}} = \frac{Q = \frac{2.3 cm^3}{sec}}{A = 20 cm^2} = \frac{0.1 \text{ cm/sec}}{\frac{30 in \; 2.54 cm/in}{300 \text{ sec}}} = \frac{0.1 \text{ cm/sec}}{0.254 \text{ cm/sec}} = 0.45$$

We must have used the wrong numbers in class because we did not get this result

by construction draw the perpendicular from the 1125 contour to the 1132 point

assume linear head drop so 1125 occurs 7/9 of the way between 1132 and 1123 (7/9)*390 = 303'



i = (1132-1125) / 230 ~ 0.03