

**DATA AT END OF LAST CLASS
WAS TO BE ANALYZED WITH
THEIS AND JACOB METHOD**

**What values did you estimate for
T and S K and Ss?**

I obtained:

$T \sim 1 \times 10^{-3} \text{ ft}^2/\text{s}$ $K \sim 1.1 \times 10^{-5} \text{ ft/s}$
 $S \sim 1 \times 10^{-6}$ $Ss \sim 1.1 \times 10^{-8}$

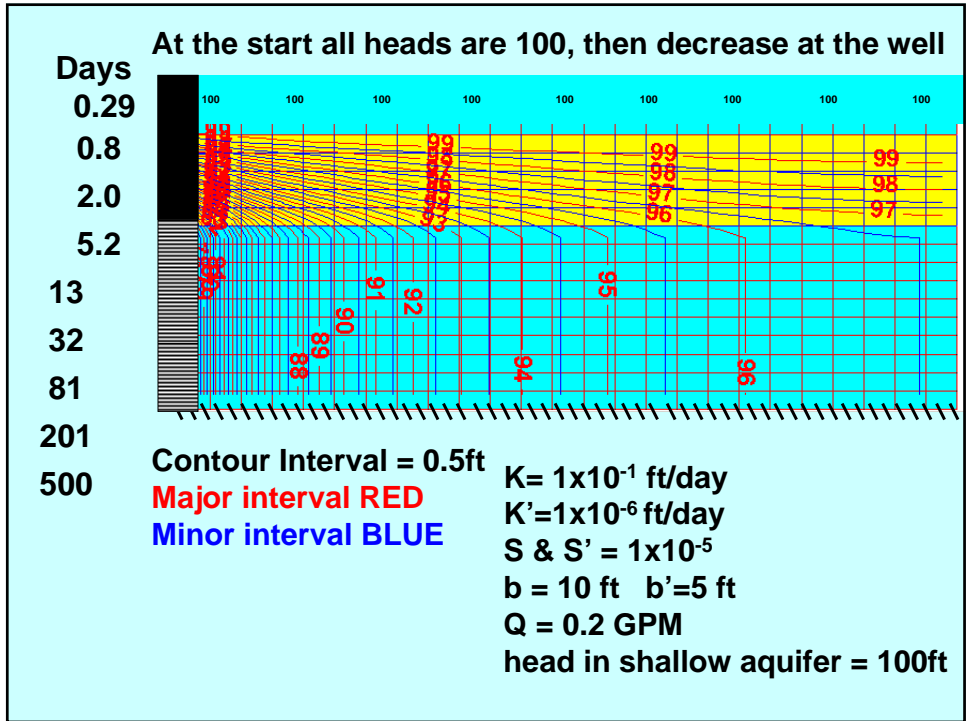
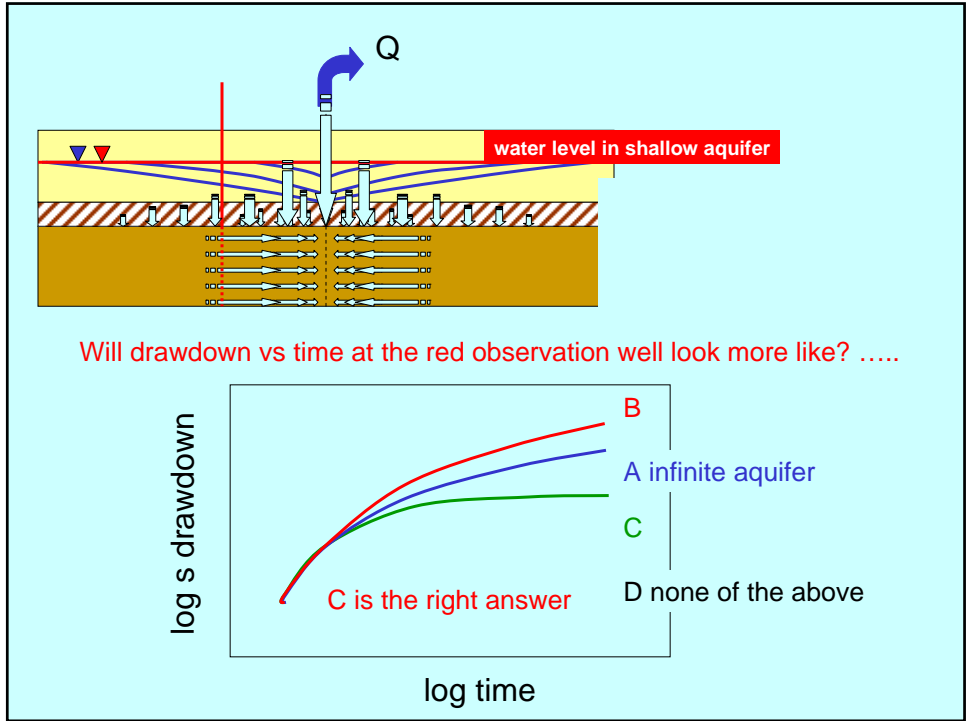
What will happen that did not occur in the completely confined aquifer?

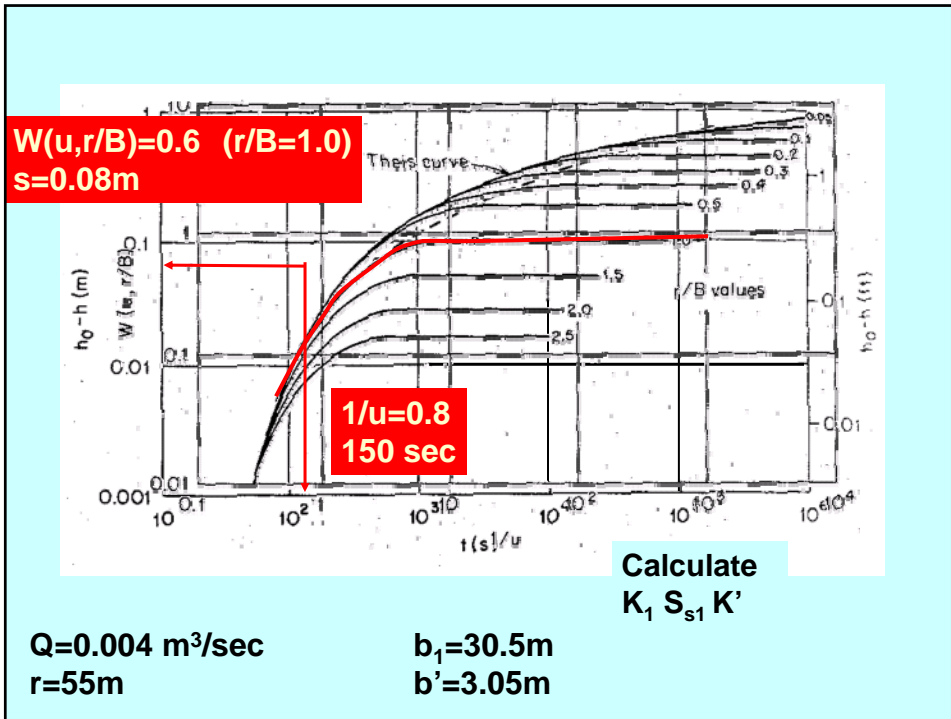
Vertical leakage, first from storage in the aquitard, then from the shallow aquifer.

What do we expect regarding the magnitude of leakage? **Greatest leakage where head difference is largest, decreasing away from the well.**

What will be the maximum extent of drawdown? **Drawdown will be limited to the radius at which the entire Q leaks from the upper aquifer to the lower.**

What controls the rate of drawdown cone development? **S & T of aquifer
AND
S and Kv of the aquitard**





Q=0.004 m³/sec **b₁=30.5m**
r=55m **b'=3.05m**

W(u, r/b)=0.6 (r/B=1.0) **1/u=0.8** **u=1.25**
s=0.08m **150 sec**

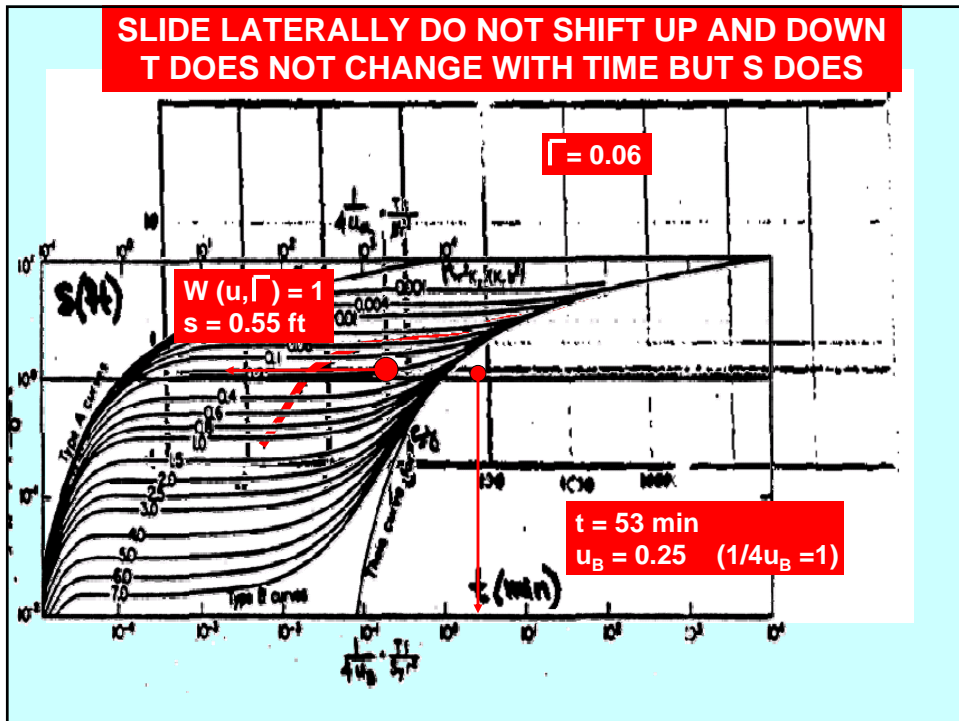
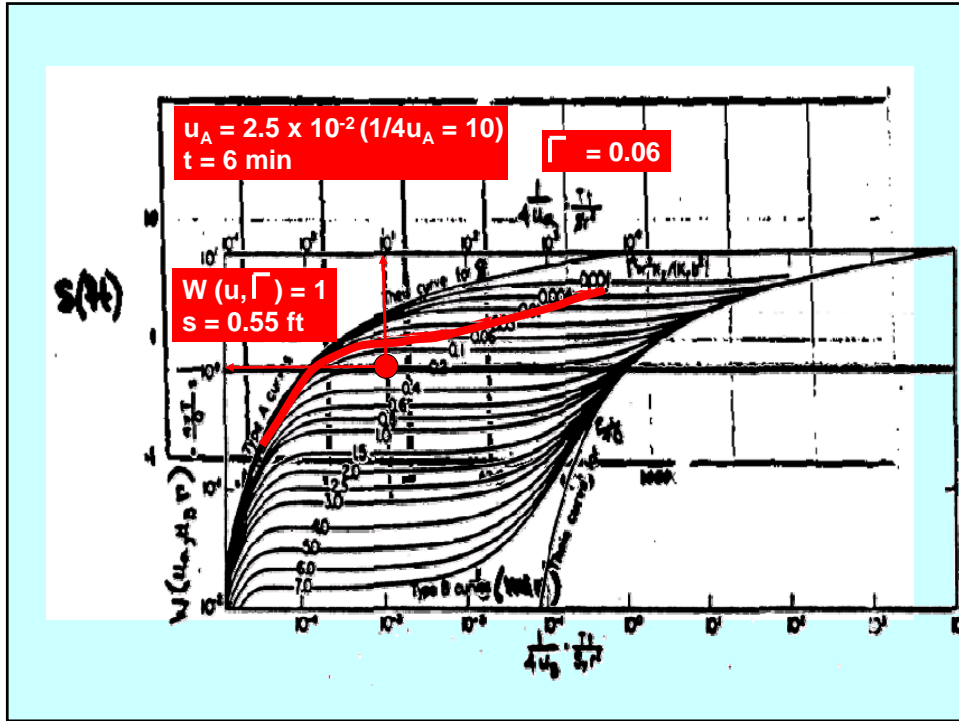
$$s = h_0 - h = \frac{Q}{4\pi T} W(u, r/B) \quad T = \frac{0.004 \text{ m}^3/\text{sec} \cdot 0.6}{4 \cdot 3.1416 \cdot 0.08\text{m}} = 2.4 \times 10^{-3} \text{ m}^2/\text{sec}$$

$$u = \frac{r^2 S}{4 T t} \quad \frac{r}{B} = r \sqrt{\frac{K'}{K_1 b_1 b'}} \quad K_1 = T/b = 7.8 \times 10^{-5} \text{ m/sec}$$

$$K' = (1/55\text{m})^2 \cdot 7.8 \times 10^{-5} \text{ m/sec} \cdot 30.5\text{m} \cdot 3.05\text{m} = 2.4 \times 10^{-6} \text{ m/sec}$$

$$S = (1.25 \cdot 4 \cdot 2.4 \times 10^{-3} \text{ m}^2/\text{sec} \cdot 150\text{sec}) / (55\text{m})^2 = 6 \times 10^{-4}$$

$$S_s = S/b = 2 \times 10^{-5} \text{ m}^{-1}$$



Match

early time $\Gamma = 0.06$

$$W(u, \Gamma) = 1$$

$$u_A = 2.5 \times 10^{-2} \quad (1/4u_A = 10)$$

$$t = 6 \text{ min}$$

$$s = 0.55 \text{ ft}$$

$$Q = 144.4 \text{ ft}^3/\text{min}$$

$$r = 73 \text{ ft}$$

$$b = 100 \text{ ft}$$

late time same Γ

slide horizontally

same $s = 0.55$

$$t = 53 \text{ min}$$

$$u_B = 0.25$$

$$(1/4u_B = 1)$$

Calculate T S K_v K_h S_y

Early time match results:

$$T = \frac{Q}{4\pi s} W(u_A, \Gamma) = \frac{144.4 \frac{\text{ft}^3}{\text{min}}}{4\pi(0.55\text{ft})} (1) = 20.9 \frac{\text{ft}^2}{\text{min}}$$

$$S = \frac{4u_A T t}{r^2} = \frac{4(2.5 \times 10^{-2}) \left(20.9 \frac{\text{ft}^2}{\text{min}} \right) 6 \text{ min}}{(73\text{ft})^2} = 2 \times 10^{-3}$$

Late time match results:

T Same (match by sliding horizontally)

$$S_y = \frac{4u_B T t}{r^2} = \frac{4(0.25) \left(20.9 \frac{\text{ft}^2}{\text{min}} \right) 53 \text{ min}}{(73\text{ft})^2} = 0.21$$

$$K_H = \frac{T}{b} = 2 \times 10^{-1} \frac{\text{ft}}{\text{min}}$$

$$K_v = \frac{\Gamma b^2 K_H}{r^2} = \frac{0.06(100\text{ft})^2 0.2 \frac{\text{ft}}{\text{min}}}{(73\text{ft})^2} = 2 \times 10^{-2} \frac{\text{ft}}{\text{min}}$$

Use distributed data and type curve to estimate aquifer properties

Notice the curve can be used for a confined or unconfined aquifer

Think about what parameters you can get from the data you have
(the exam may only ask you to report aquifer parameters)

Distance of fully penetrating observation well from pumping well = 190 ft

Initial saturated thickness = 88 ft

Pumping rate = 35 GPM