



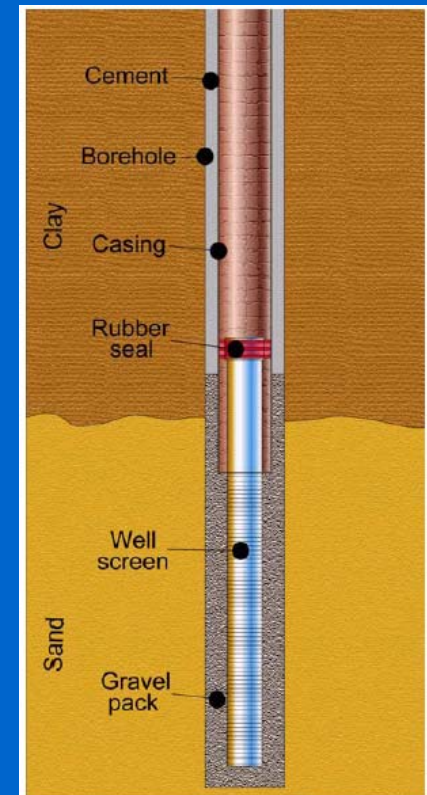
Pumping tests



Interference tests

Types of Test

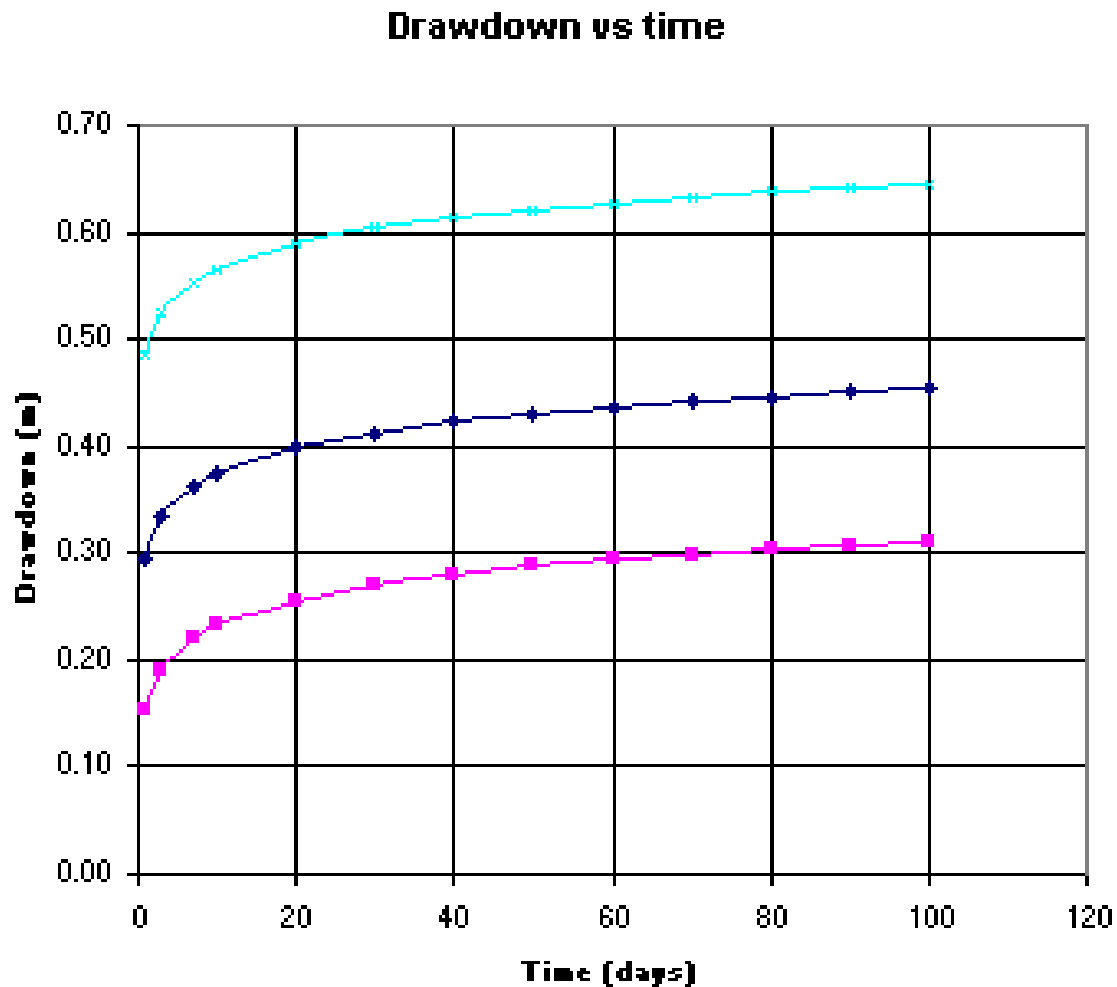
- Single well tests
 - Slug tests
 - Pumping tests
 - Specific capacity
 - Step drawdown
 - Largely measure well properties
- Multiple well tests
 - Require observation wells
 - Measure aquifer properties
 - Permeability, storage, aquifer type



The ideal

- Initial conditions
 - Ideally in equilibrium
 - Monitor background trend
- Impose a known stress
 - Ideally a constant pumping rate
 - Monitor drawdown response
 - In pumped well
 - In observation wells
 - In wells beyond pumping influence
- Cease pumping
 - Monitor recovery

Idealized drawdown response

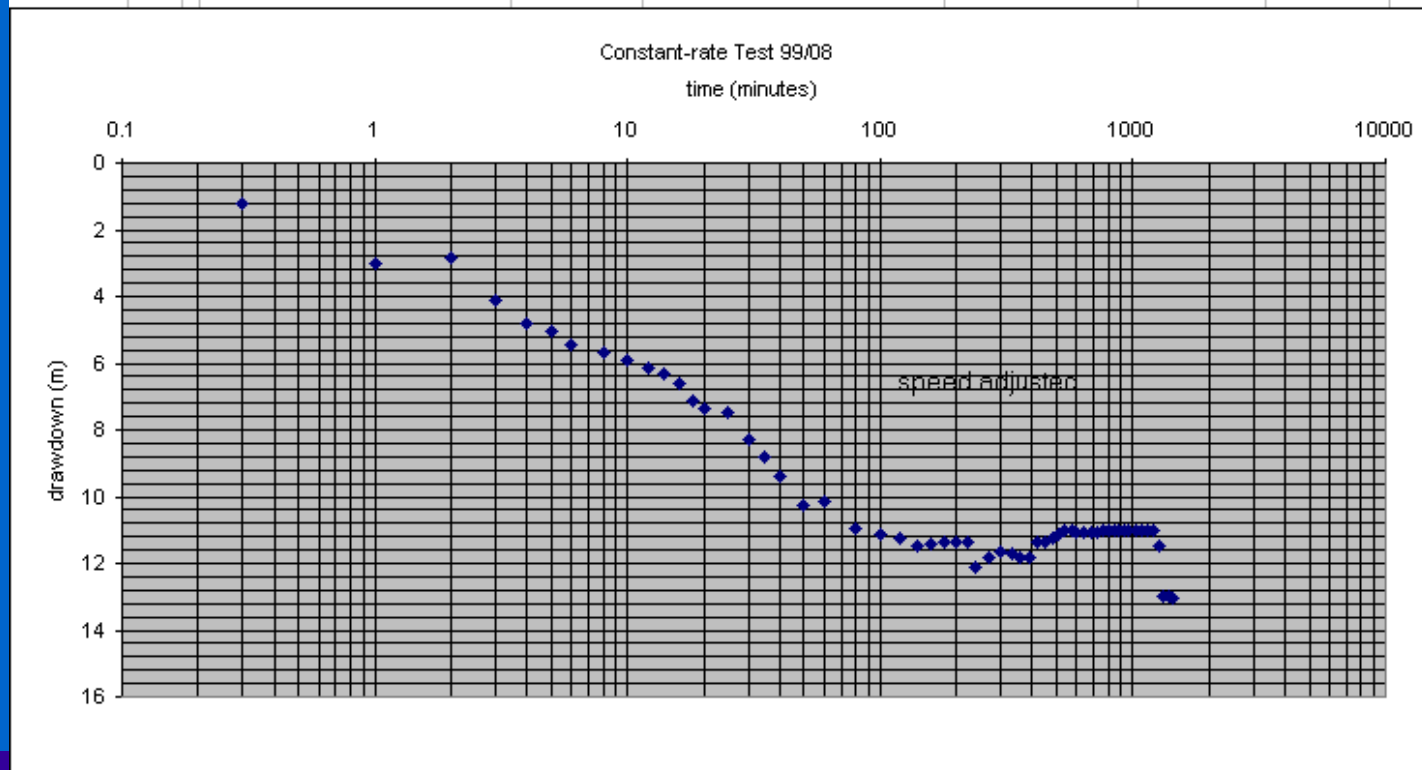


The reality

- Initial conditions
 - Normally unsteady
 - Tidal, barometric & other pumping effects
- Impose a known stress
 - Pumping rate varies or pump breaks down
 - Monitor drawdown response
 - Often no observation wells available
 - Measurement difficulties
- Whatever happens
 - Carefully record what and when!

MRD drawdown measurements

Drawdown Phase Borehole 01/11				
Project	Muaivusa GW Drilling	S.W.L	10.88	m
Location	Muaivusa	Pump Setting	37.13	mb datum
Borehole Number	BH01/11	Discharge rate	54.432	m ³ /day
Date of test	21/06/01		0.63	L/s
Type of pump	Electric Submersible	Change s1	3.34	m
Transmissivity T(Jacob's method)	3.0 m ² /d	Change s2	3.89	m
T2	2.6 m ² /d			

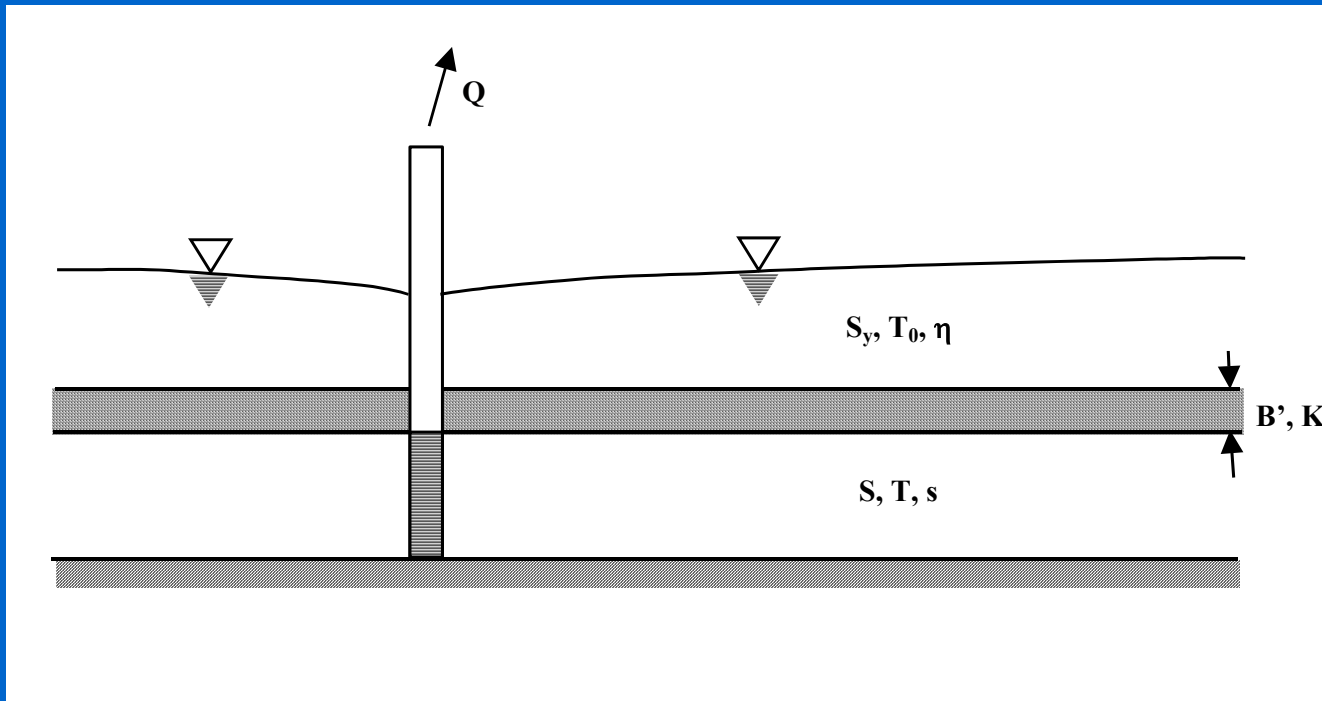


Analysis

- Typical assumptions
 - Homogeneous aquifer
 - Infinite extent
 - Water released from storage instantaneously
 - No well storage
- Parallels with ER interpretation
 - Layered models
 - Trial and error approach

Analysis

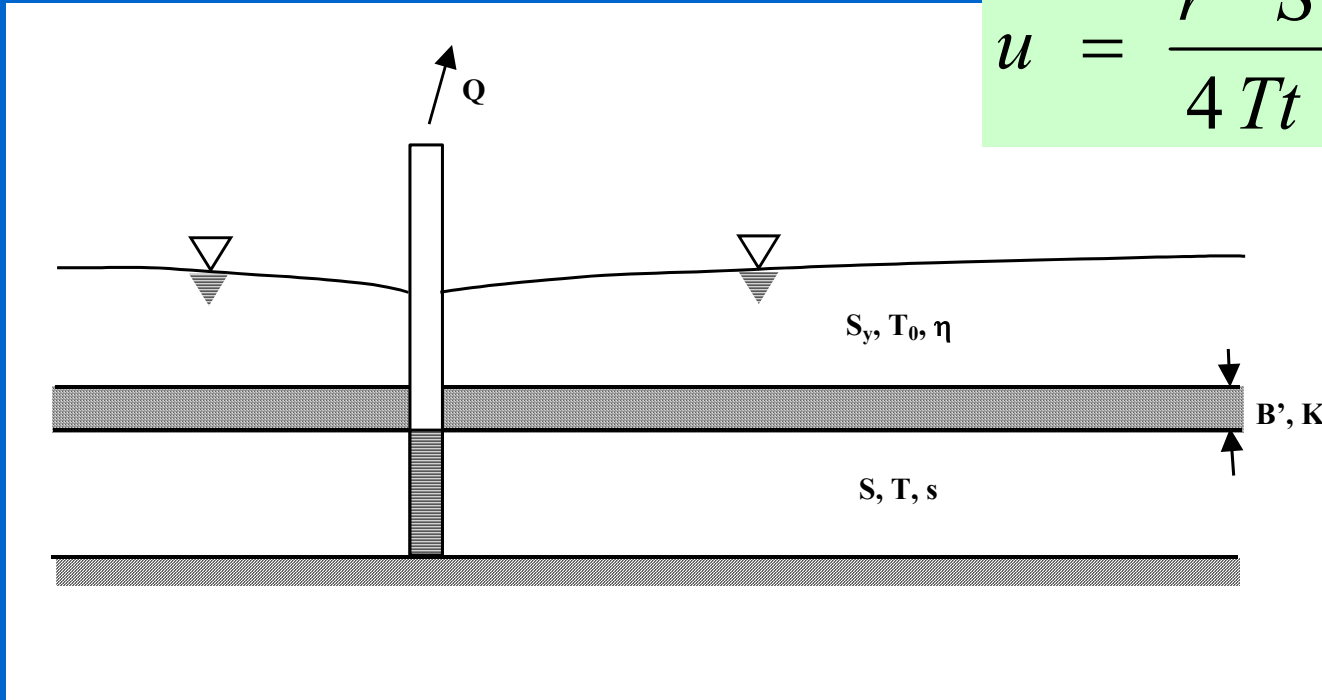
- Drawdown response to pumping in an extensive confined aquifer



The Theis solution

Assumptions:
Infinite extent, homogeneous, fully
confined

$$s = \frac{Q}{4\pi T} W(u)$$
$$u = \frac{r^2 S}{4Tt}$$



Pros and cons

- Advantages
 - Provide in-situ parameters averaged over a large volume of aquifer
 - Conductivity and storage properties measured in a single test
 - Leakage properties can be directly measured
 - Test condition closely resemble the real application (if pumping interference is a concern)

Disadvantages

- Non-uniqueness of pumping test interpretation
 - Similarity in response of leaky, unconfined and bounded systems
- Expense
 - Installation of observation wells and overheads involved in running a test
 - May be justified when done in conjunction with well development at the test site