

Wells & Groundwater

Tom Konsler, R.S.
Environmental Health Director
Orange County Health Department
306-C Revere Rd
Hillsborough, NC 27278
919-245-2360

Background

- **Approximately 40% of OC Population relies on groundwater for drinking water source**
 - **Board of Health adopted well regulations for Orange County in 1980**
 - **Expanded to groundwater protection regulations in mid 90's**
- 

Groundwater Program

- **Well regulations provide for:**
 - **Siting, specifications, construction observation, & approval**
 - **Drinking water wells**
 - **Irrigation / Agricultural**
 - **Monitoring**
 - **Geothermal**
 - **Well abandonment**



Groundwater Program

- **Orange County Health Department also provides:**
 - **Water sampling**
 - **Consultation for water treatment**
 - **Iron**
 - **Manganese**
 - **Low pH**
 - **Arsenic**
- 
- The background of the slide features a blue gradient with several concentric white circles of varying sizes, resembling ripples on water, located primarily in the lower right and bottom center areas.

Well Siting & Permitting

- **Approximately 350 wells per year**
- **Average well in this area:**
 - **300 feet deep**
 - **59' depth to bedrock**
 - **70' casing (63' minimum required)**
 - **18 GPM**
 - **First water hit averages 160 feet deep**
 - **Average yield of 10 GPM**
- **Records are on file - available on request**

Underground Profile

Soil

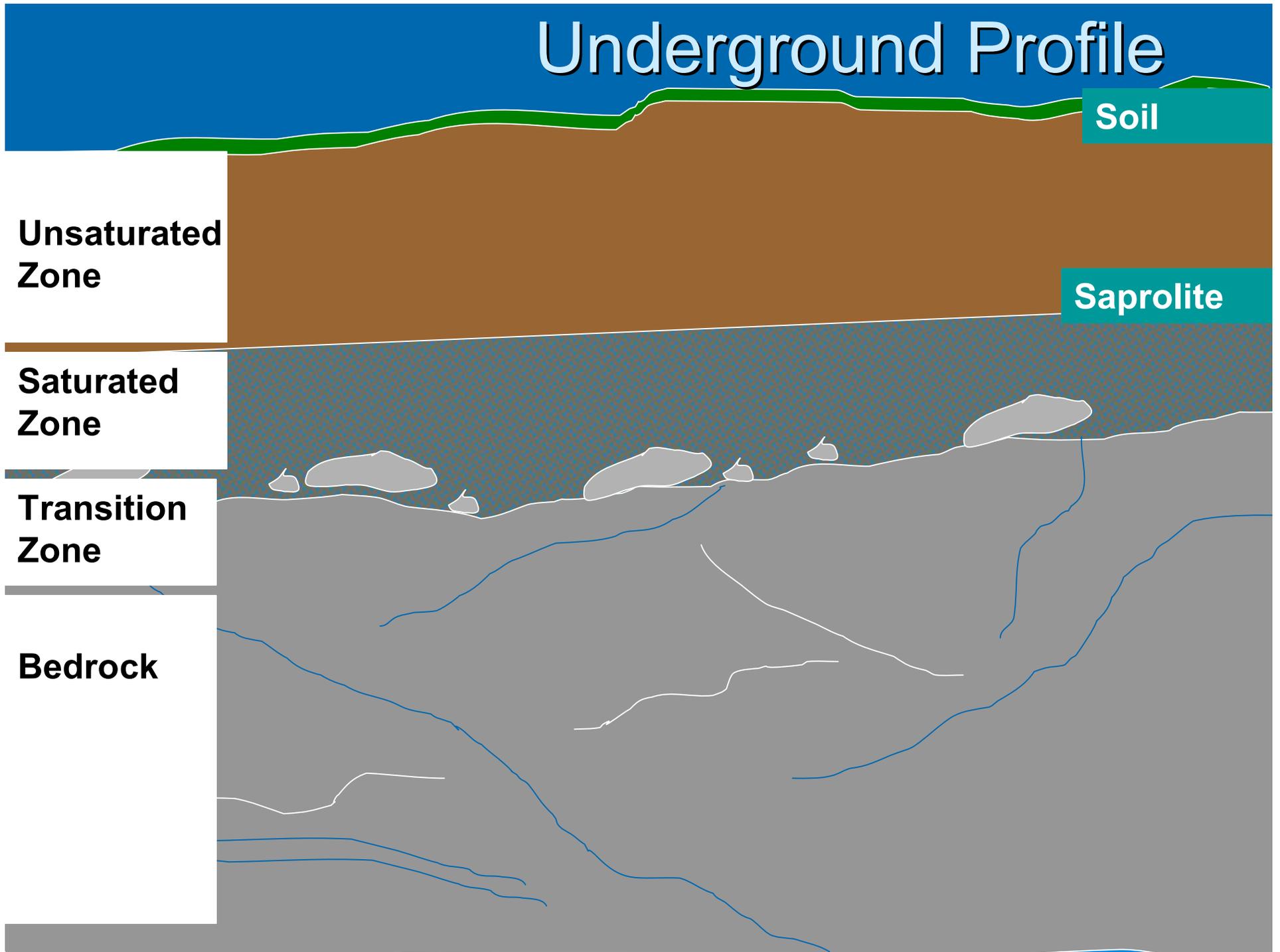
Unsaturated
Zone

Saprolite

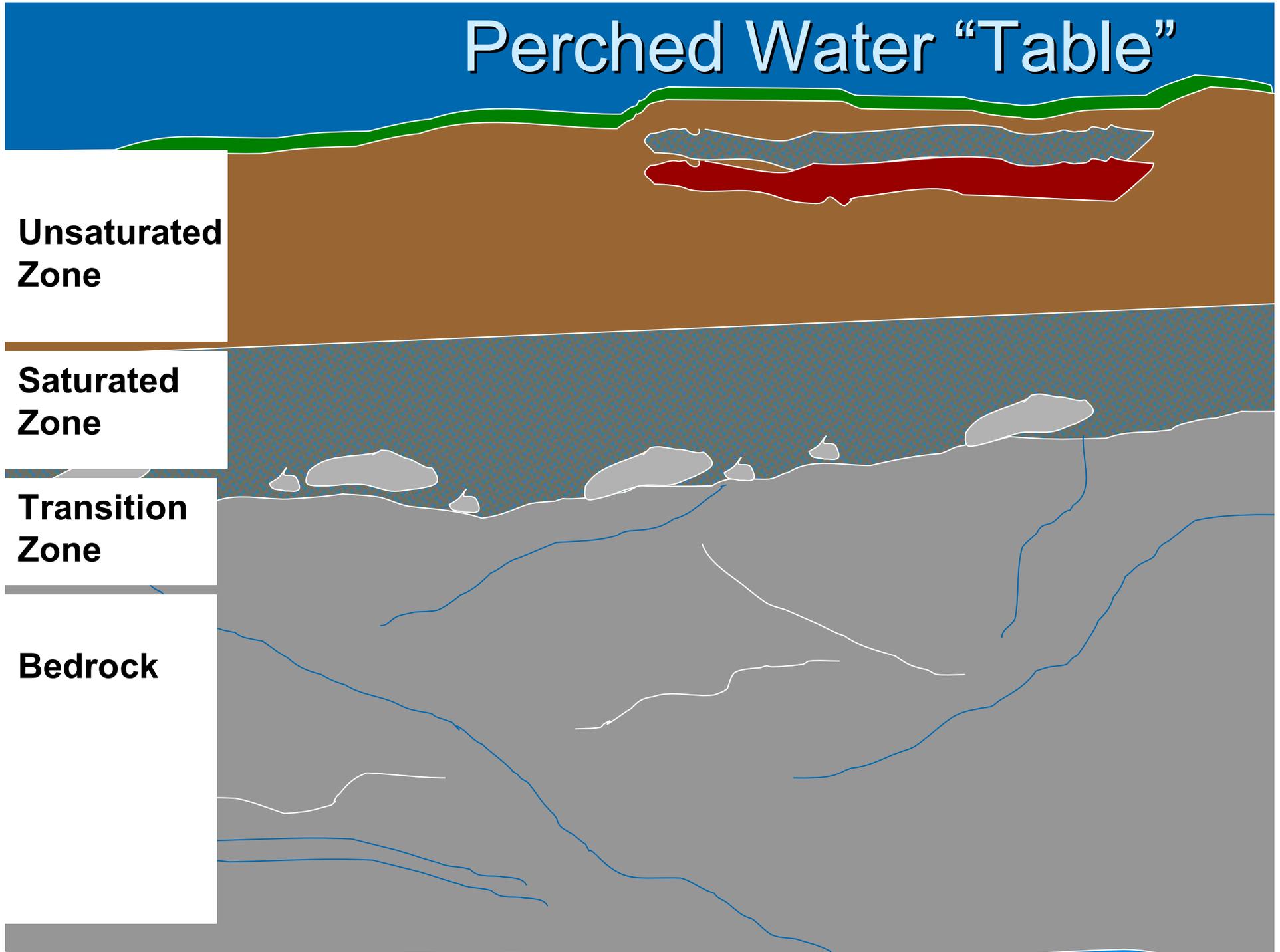
Saturated
Zone

Transition
Zone

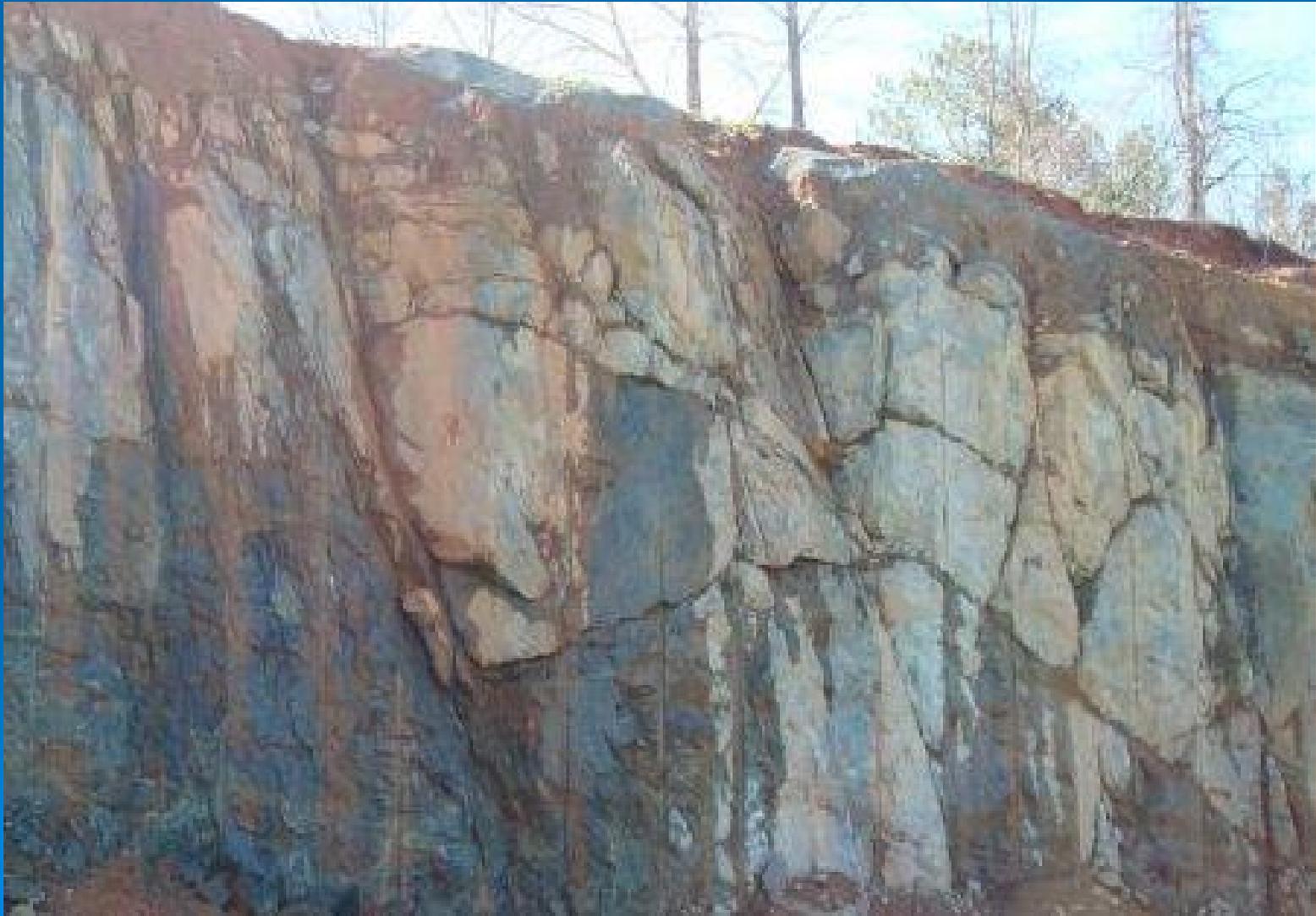
Bedrock



Perched Water "Table"



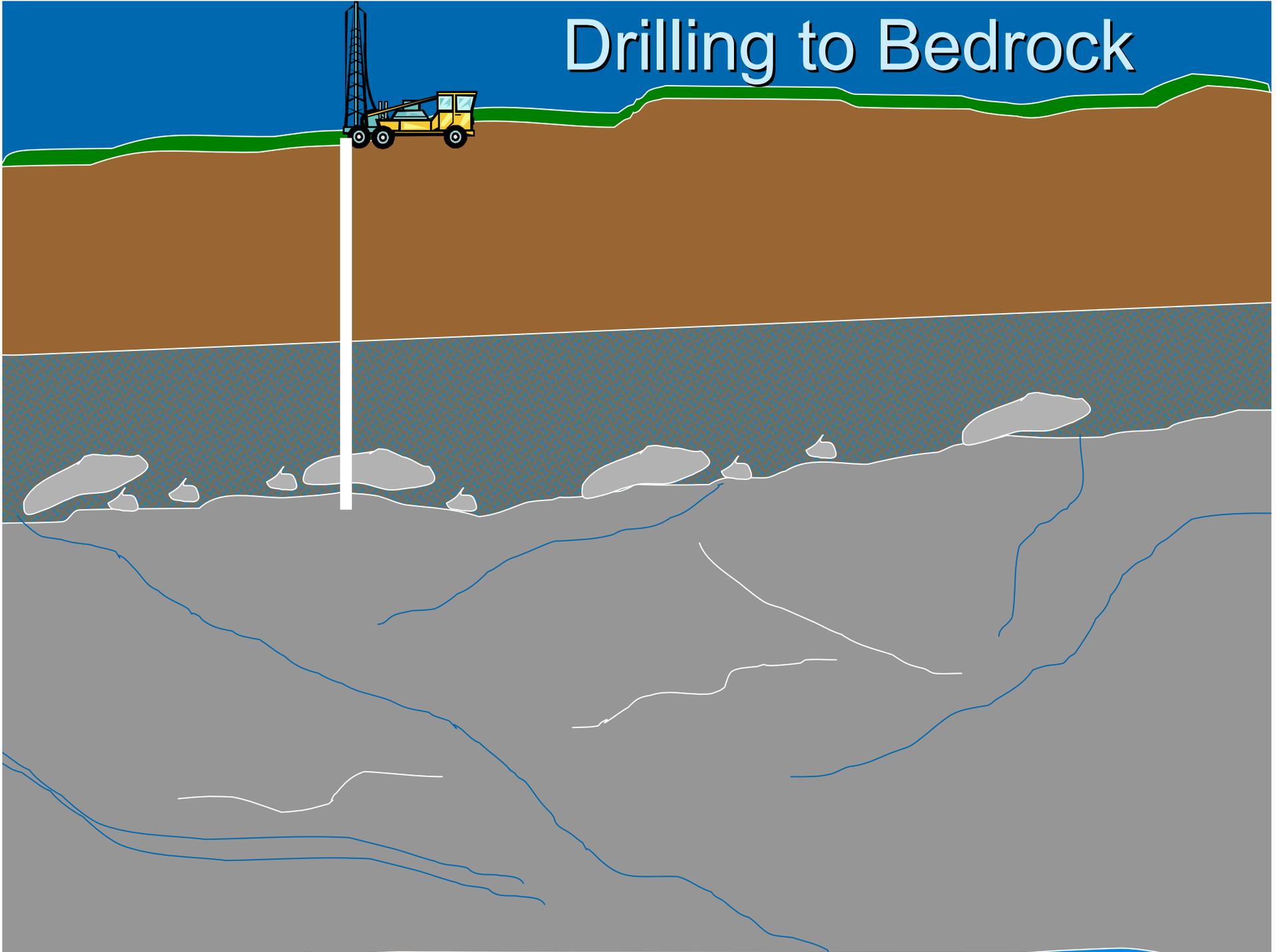
Top of Bedrock



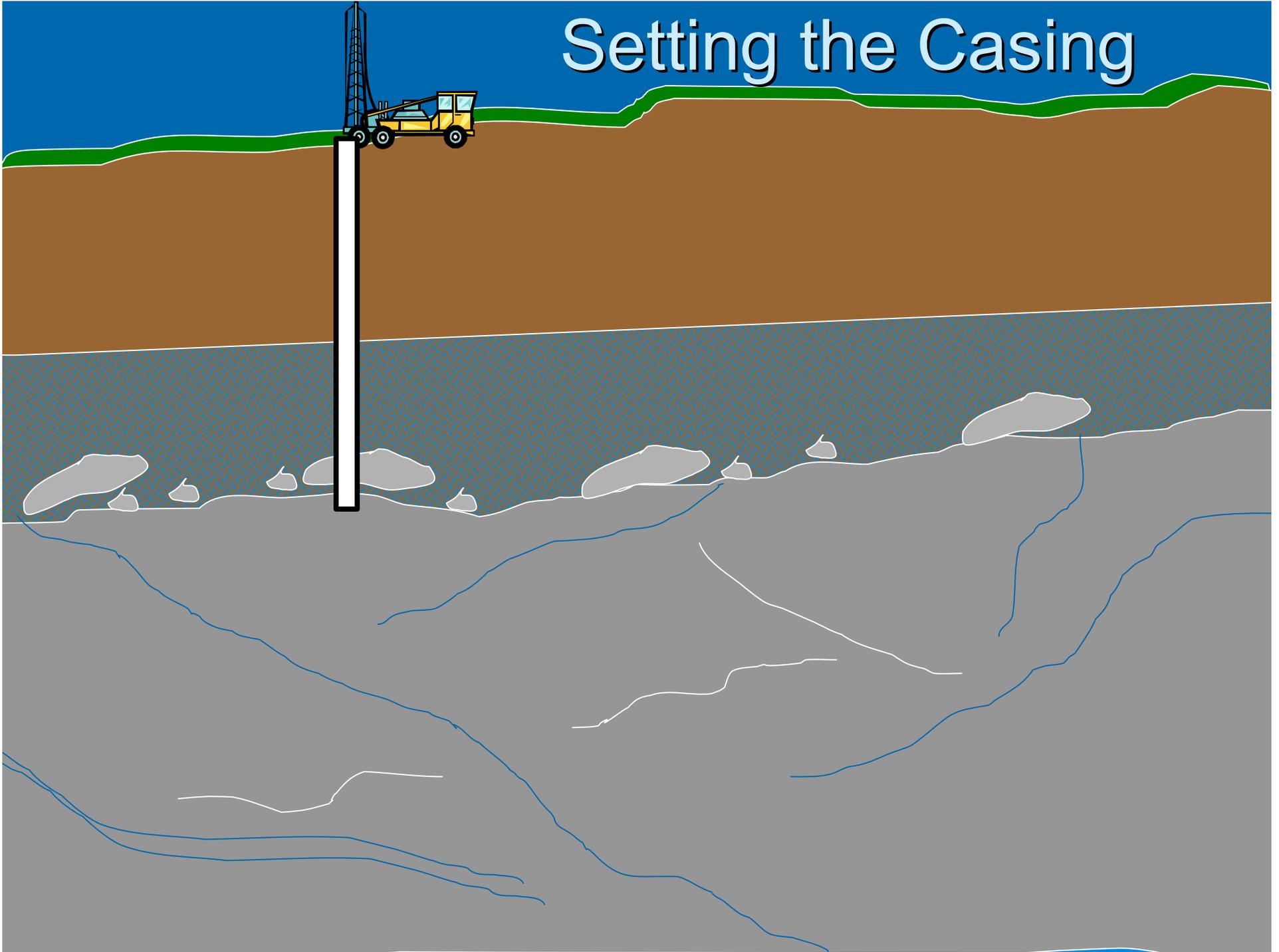
High Angle Fracture



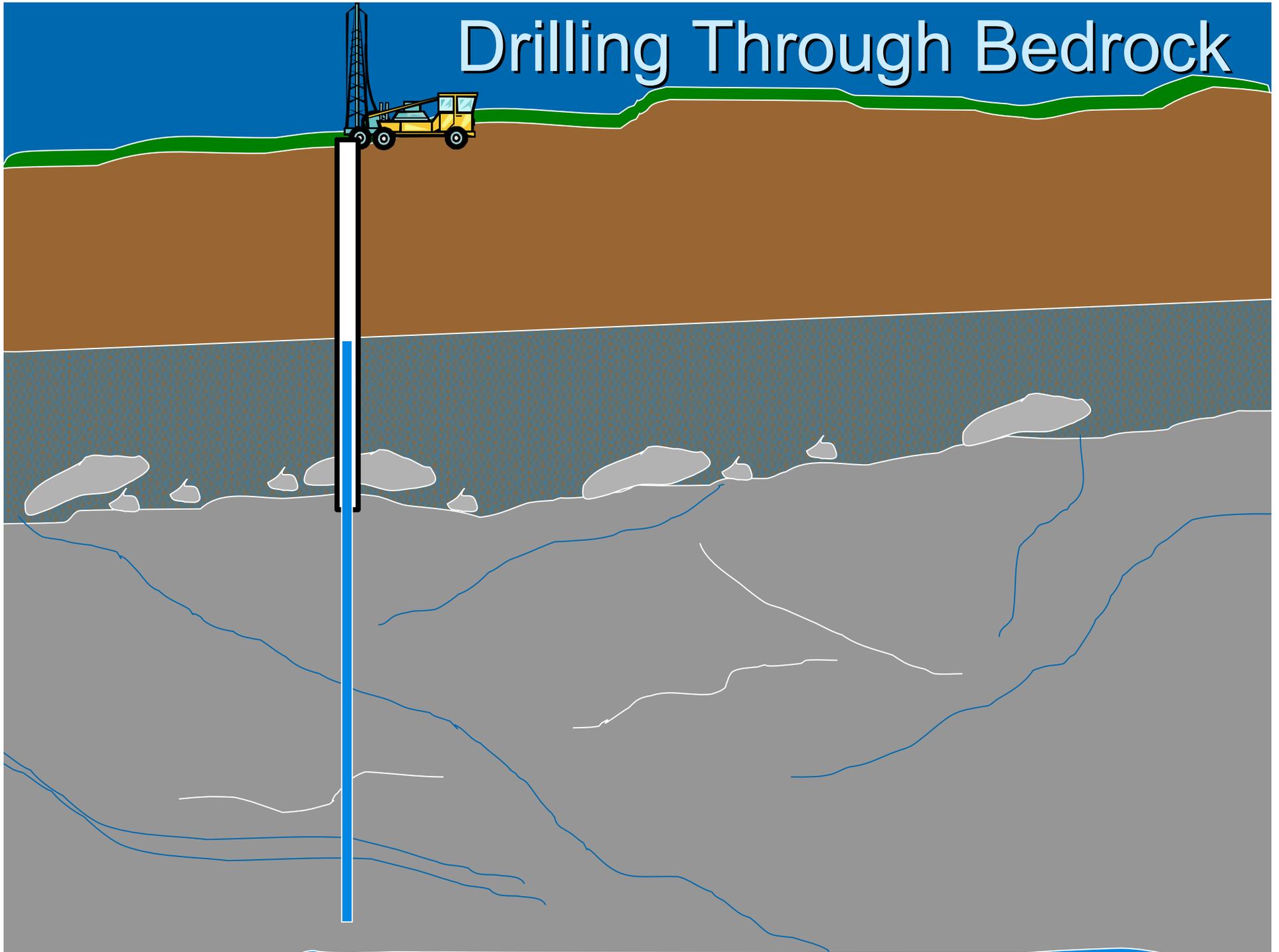
Drilling to Bedrock



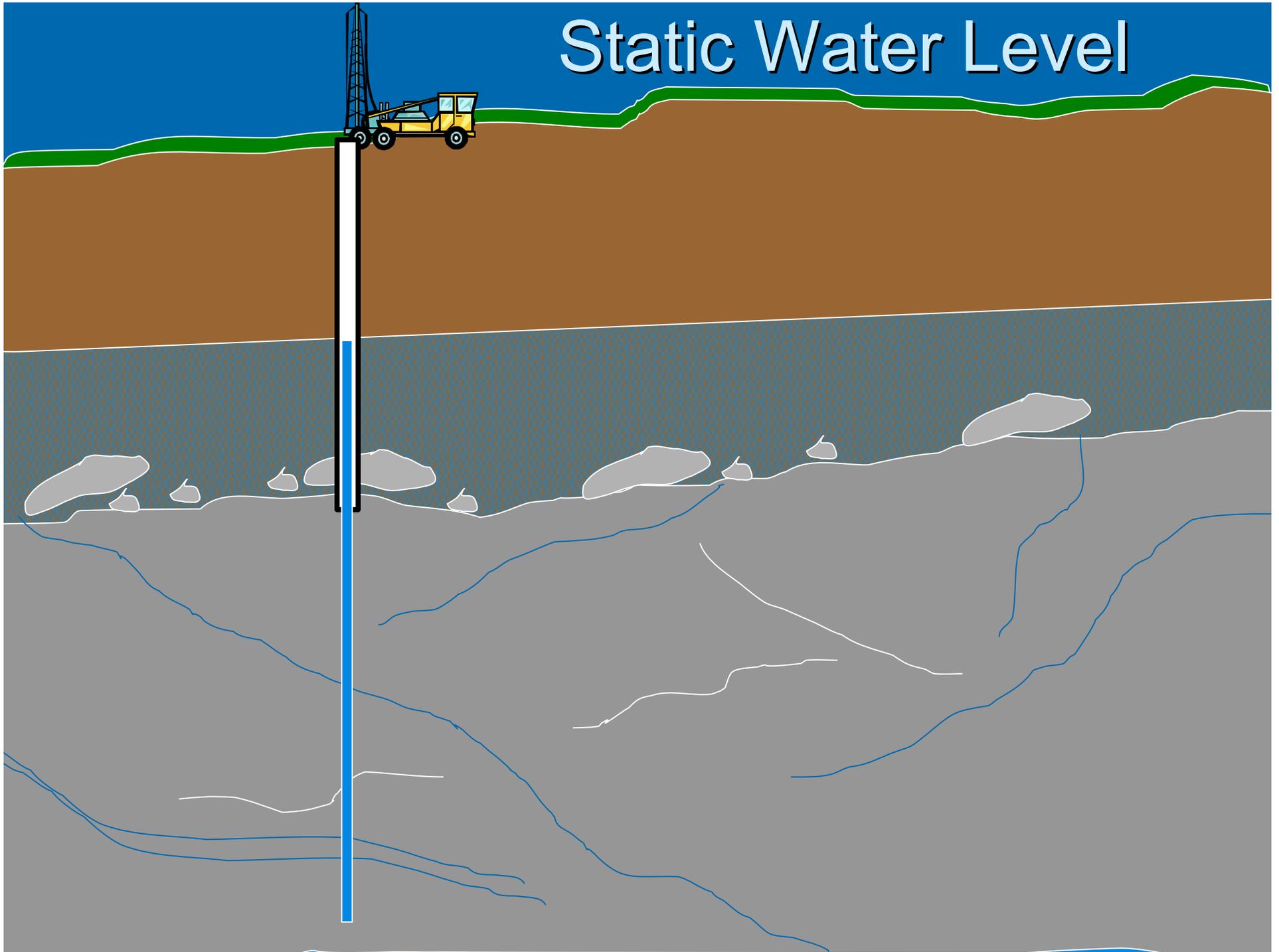
Setting the Casing



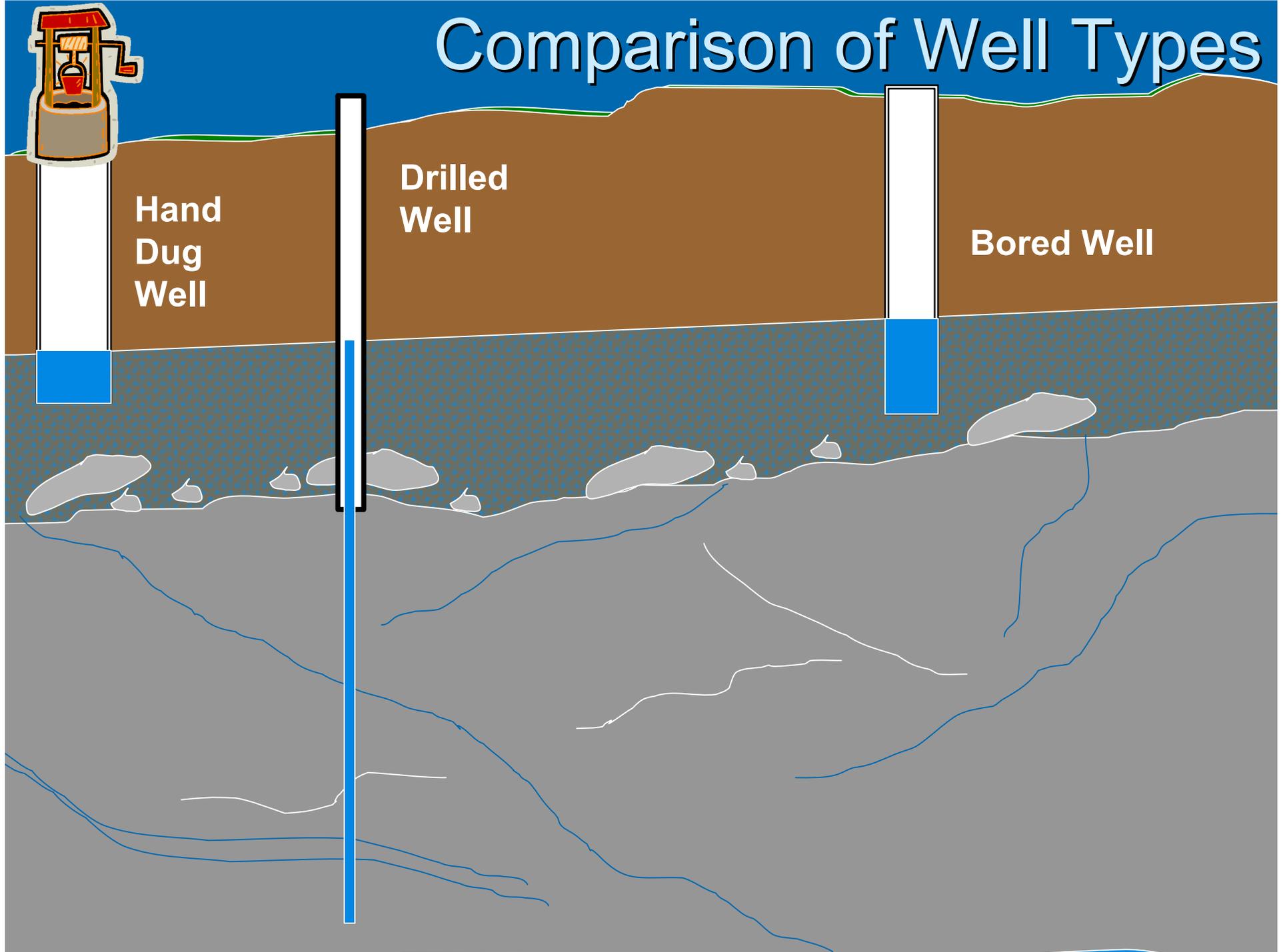
Drilling Through Bedrock



Static Water Level



Comparison of Well Types

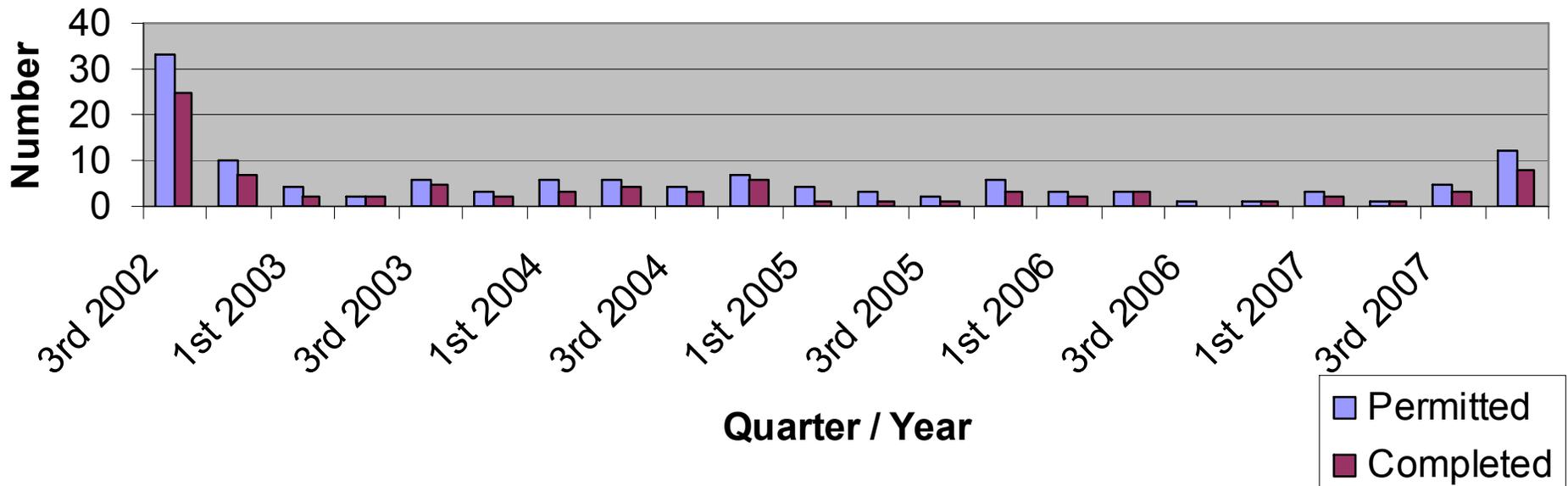


Well Yield vs. Withdrawal

- Yield estimated at time of drilling
- Generally few high yield water bearing zones >400'
- 1 to 2 GPM can sustain a household
- Household use = 60 gallons/person/day

Drought Effects on Well Activities

Replacement Wells Permitted and Completed Thru 2007



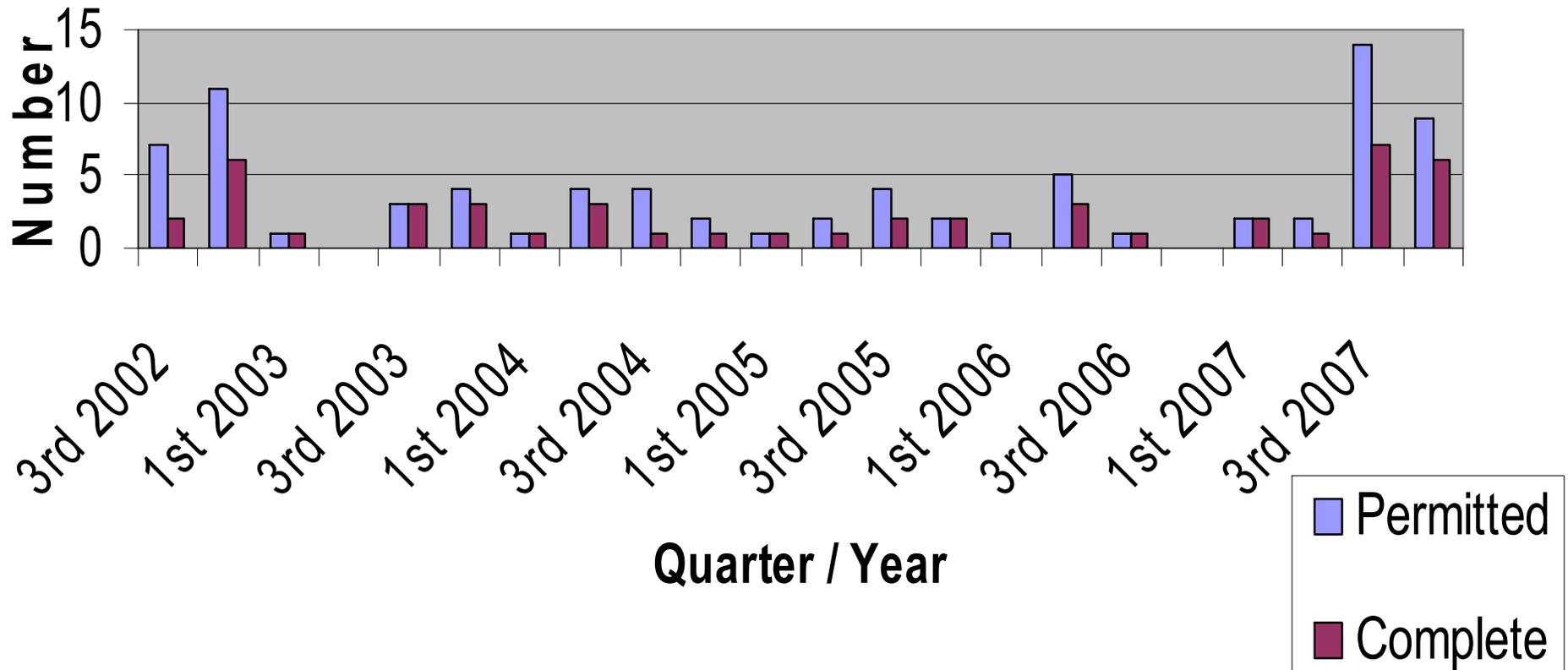
Replacement Wells

- **All water supplies that went dry were:**
 - Springs
 - Shallow bored wells
 - Hand-dug wells
 - Shallow drilled wells - <75 feet in depth
- **Most “borderline” wells replaced in the 2001 – 2002 drought**
- **No observations of drought effects on viable wells**

Drought Effects on Well Activities

Irrigation Wells Permitted and Completed

Thru 2007

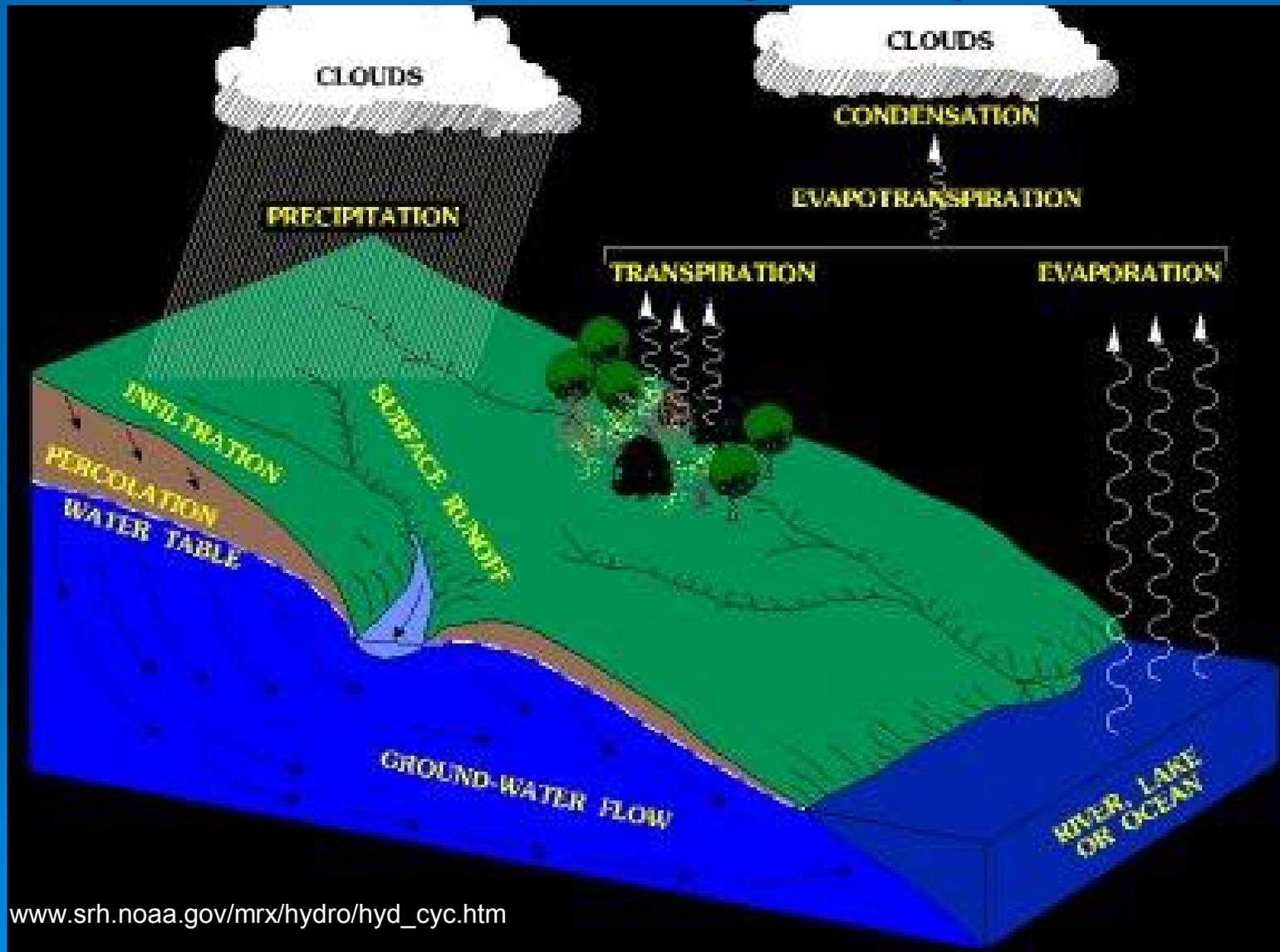


Irrigation Wells

- **Marked increase in agricultural and irrigation wells in the past 6 months**
 - **Agricultural**
 - Replacing springs, ponds, and creeks
 - **Residential irrigation**
 - Both rural and in-town



The Hydrologic Cycle



Hydro - Cycle Manipulation

- Reduction of runoff
 - Landscaping for retention
 - Less curb & gutters
 - Less lawn, more natural areas
- Control withdrawal
 - Water conservation
- Return



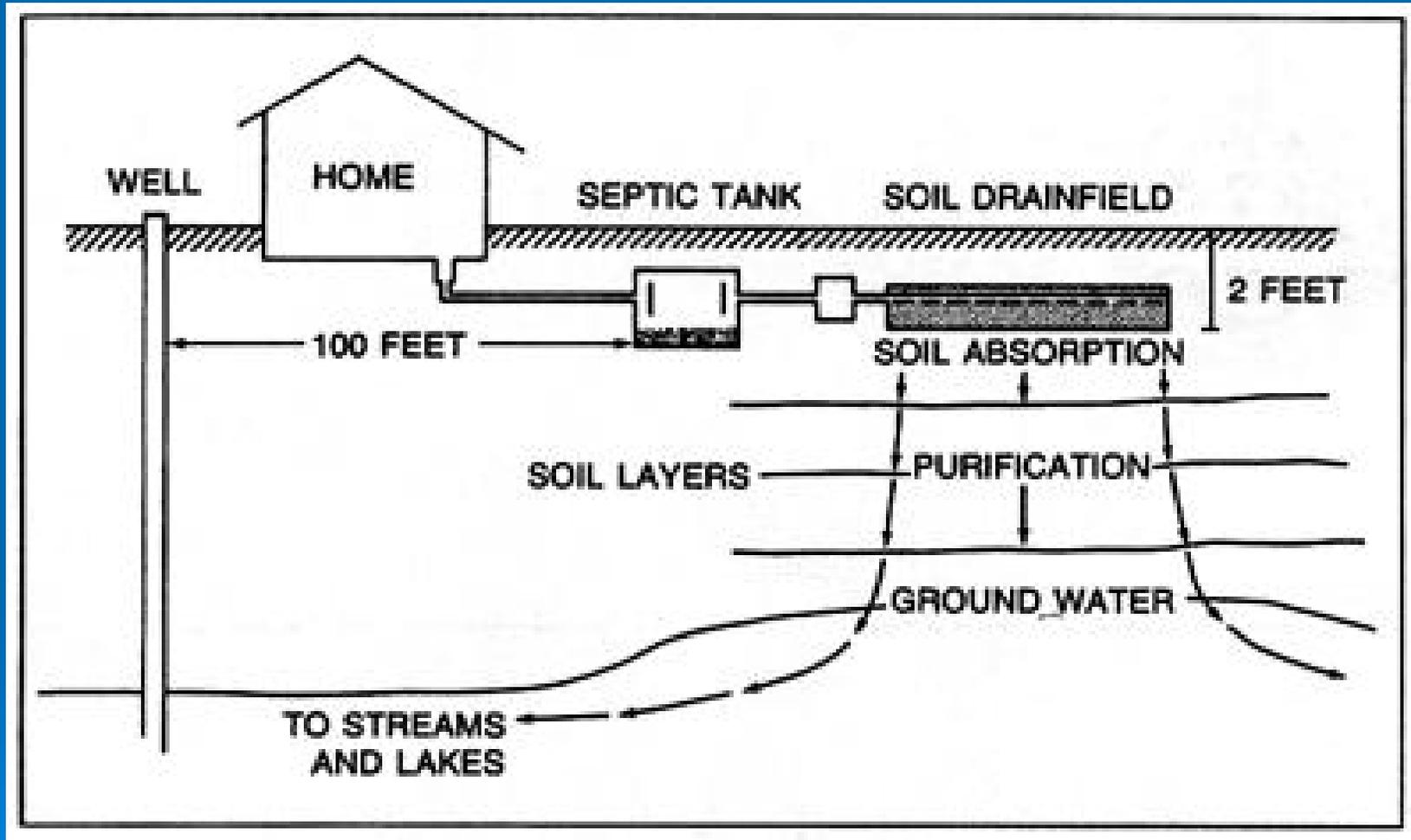
Water Conservation

- **Cost savings for well**
 - Electricity
 - Less wear & tear on equipment
 - Treatment system maintenance
- **Septic system benefits**
 - Enhances performance
 - Increases the life expectancy
- **Ecologic responsibility**

Targeting Conservation



Recharge / Recycle



Adapted from Tyler et.al., 1977

Efforts in Orange County

- H2Orange – multi departmental group
 - Drought response
 - “Dealing With the Drought” workshops
 - Promote education, conservation
 - www.h2orange.org

- Environmental Responsibility Goal
- Water Resources Coordinator
- DWQ/USGS Work in Duke Forest

Water Resources Committee 2001 Recommendations

- **Create “ground water monitoring system”**
 - **Further research into radon in certain areas**
 - **Consider a “water budget” approach to water resources planning**
- 

Water Resources Committee 2001 Recommendations

- **Incorporate sustainable ground water yield into development decisions**
 - **Consider requiring well site locations for all new subdivisions, and create “well reserve areas”**
 - **Promote water conservation for all users**
- 