

Groundwater Movement

Groundwater flows downhill in the direction of the slope of the water table. Usually, this downhill movement is slow because the water has to flow through numerous tiny pores in the subsurface material. The tendency of a material to let water pass through it is its **permeability**. Materials with large, connected pores, such as sand and gravel, have high permeability and permit relatively high flow velocities up to hundreds of meters per hour. Other permeable subsurface materials include highly fractured bedrock, sandstone, and limestone.

Permeability Groundwater flows through permeable sediment and rock, called **aquifers**, such as the one shown in **Figure 10.3**. In aquifers, the pore spaces are large and connected. Fine-grained materials have low permeabilities because their pores are small. These materials are said to be impermeable. Groundwater flows so slowly through impermeable materials that the flow is often measured in millimeters per day. Some examples of impermeable materials include silt, clay, and shale. Clay is so impermeable that a clay-lined depression will hold water. For this reason, clay is often used to line artificial ponds and landfills. Impermeable layers, called **aquicludes**, are barriers to groundwater flow.

Flow velocity The flow velocity of groundwater depends on the slope of the water table and the permeability of the material through which the water is moving. The force of gravity pulling the water downward is greater when the slope of the water table surface is steeper. Water also flows faster through a large opening than through a small opening. The flow velocity of groundwater is proportional to both the slope of the water table and the permeability of the material through which the water flows.

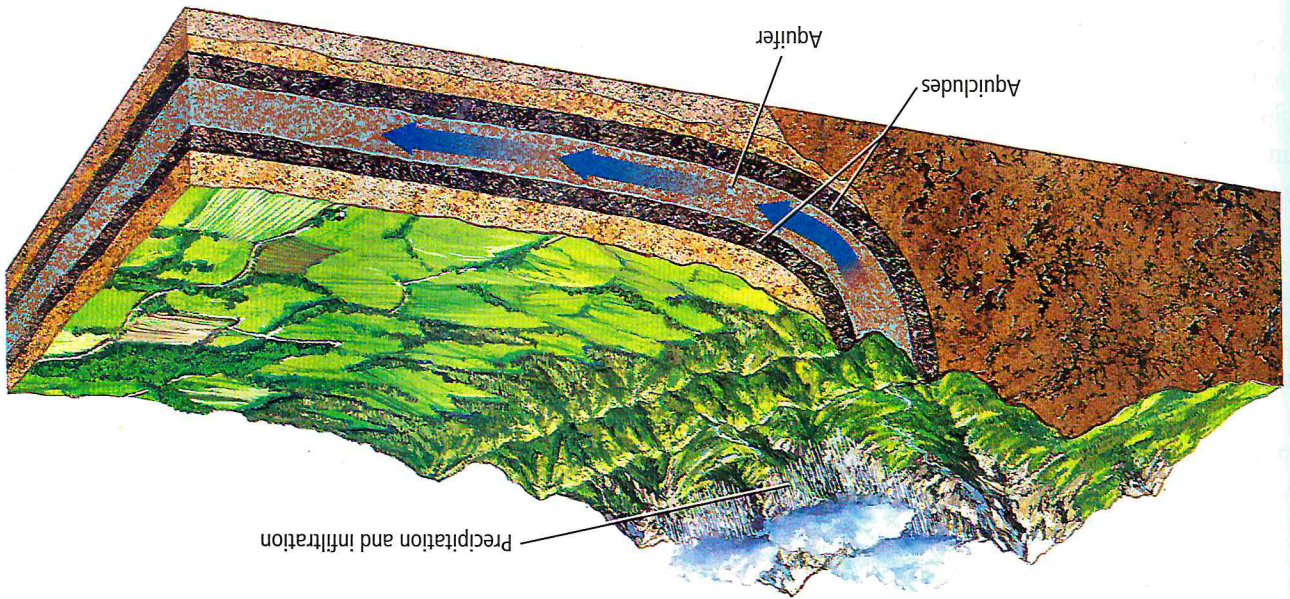


Figure 10.3 An aquifer is a layer of permeable subsurface material that is saturated with water. This aquifer is located between two impermeable layers called aquicludes.