Hydrogeology Lab

Lab. No. 2

Flow direction using a three – point technique

A three- point problem helps to map the groundwater potential (i.e. the direction in which the groundwater is flowing). There are some important definitions (total head, elevation, and water level) and concept (hydraulic head and hydraulic gradient) that you need to know before solving a three-point problem.
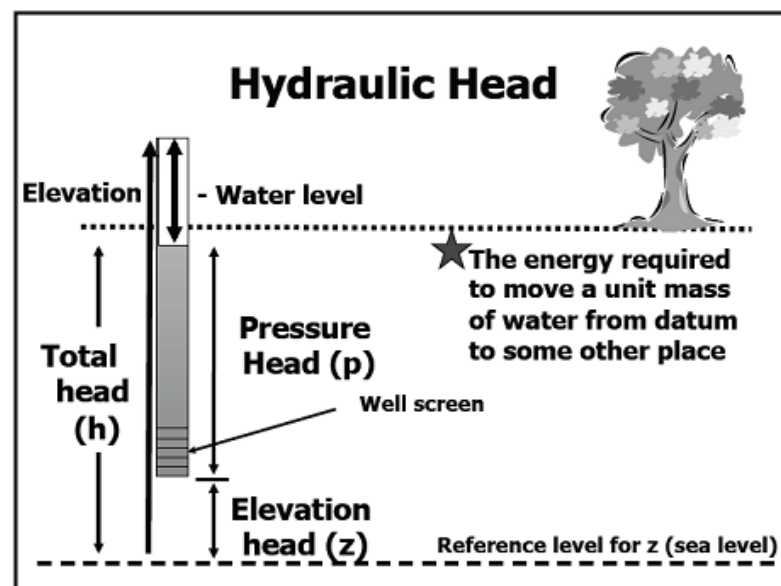

Fig. (1): Hydraulic head

Hydraulic head is "the energy required to move a unit mass of water from datum to some other place". The distribution of hydraulic head through an aquifer determines where the groundwater will flow. From Fig. (1) and easy representation of total head, elevation, and water level is shown. The elevation is considered the distance from the reference level (sea level) to the top of the well casing. The total head (will also be referred to as head) is the sum of the elevation head and the pressure head. The water level is the depth to the water table (i.e, the length from the top of the well casing to the top of the water level.
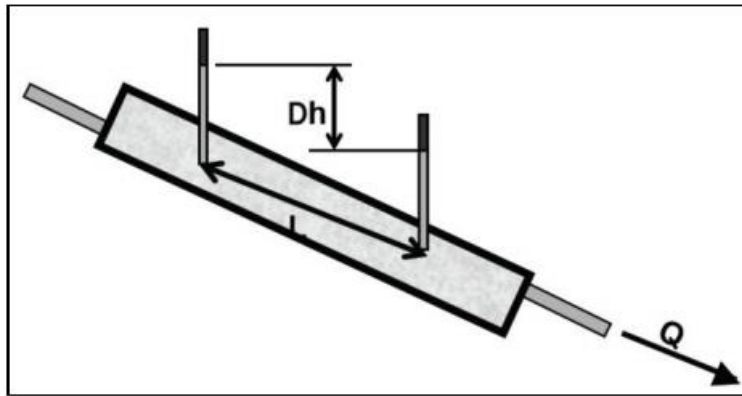
Fig. (2): Hydraulic gradient.

From Fig. (2), hydraulic gradient (*i*) is defined as "the change in total head (Dh is also shown as Δh) with a change in distance (L) in a given direction". Q is the groundwater flow, and is defined as "the volume rate of water flow". The groundwater will always flow from high head to low head.

Example Problem Information

	Well A	Well B	Well C
Location (ft.)	(1000, 1000)	(3000, 2000)	(1500, 3000)
Ground Elevation (ft.)	585	510	553
Depth to Water (ft.)	75	21	59

Estimate groundwater flow direction and hydraulic head magnitude.