V. GROUND-WATER FLOW SYSTEMS

Pertinent 30CFR[1] Sections:

Description of hydrology and geology.

Ground-water information.

Part of the precipitation (rain, snow, etc.) that falls on the land infiltrates through the soil or rock to the water table. The long-term effect of infiltration is the development of a ground-water flow system. The direction of flow is downgradient from areas of recharge to areas of discharge (See figure V-l).

Ground-water flow systems are of three types: local, intermediate, and regional. In a local flow system, the recharge area is at a topographic high, and the discharge area is at the adjacent topographic low. In a regional flow system, the recharge area is at major drainage divides and the discharge areas are at major rivers or lakes at the lowest level of the drainage basin. Intermediate flow systems occur between these two flow systems and have one or more topographic highs between the recharge and discharge areas.

The ground-water conditions in a permit area depend on the flow system in relation to the location of the proposed excavation. A mountain-top mining excavation will encounter some ground-water in the local water table flow system. In a topographic high within the recharge area of the flow system, the ground-water discharge resulting from this type of excavation may be high initially but will decrease within a short time. The length of time depends on the extent of the aquifer(s) and the hydraulic properties of the aquifer system(s).

A proposed underground-mine excavation beneath or near a major river could have a combination of ground-water flow conditions, with local, intermediate, and regional discharge. The dominant condition will be related to the regional flow system. Here the ground-water discharge will be continuous and long term and will have to be controlled by pumping, or confined by grouting to provide safe working conditions.

In many coal-bearing areas, confining beds and fractures may have a significant effect upon the flow lines within the ground-water flow systems. As shown in figure V-2, underclays and semiconfining beds may create perched ground-water systems. Springs merge at the exposed junction of water-bearing rock units and the impermeable underclays but can also occur along other geologic controls such as fault traces. Fractures also provide subsurface channels for ground-water flow, as shown in figure V-2.

[1]CFR=Code of Federal Regulations

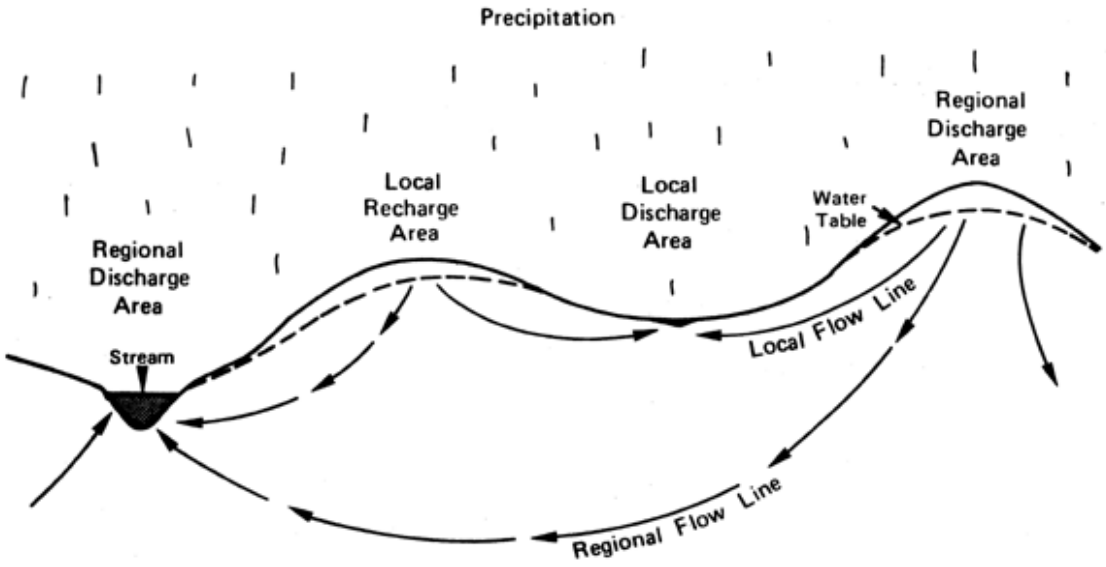

Figure V-l.— Idealized local and regional ground-water flow systems. (Modified from Toth, 1963)

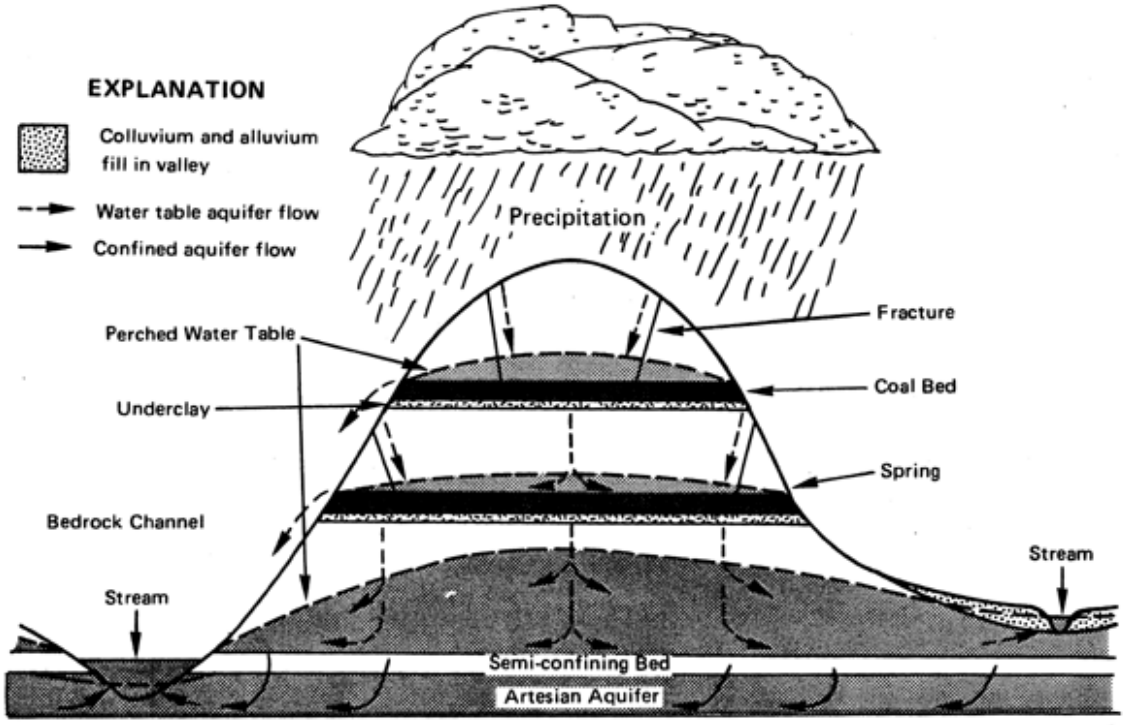

Figure V-2.— Generalized storage and movement of ground water in cross section. (Modified from Leist and others, 1982, fig. 7.1-1)