

## VI. HYDROLOGIC-SETTING (HS) CLASSIFICATION SYSTEM

Pertinent 30CFR<sup>1</sup> Sections:

Description of hydrology and geology.

Ground-water information.

Cross sections, maps, and plans.

The hydrologic-setting (HS) classification system categorizes many hydrologic factors into an alphabetic code to describe the occurrence of ground water within or adjacent to the coal seam to be mined. Permit areas range in size from several acres to several square miles and thus may contain a variety of the hydrologic as well as geologic settings.

Factors considered in the hydrologic-setting classification system include:

- (1) the position of the coal bed to be mined, which could be wet or dry, with respect to aquifers,
- (2) the geologic materials above and below the coal bed and whether they act as confining beds or as aquifers, and
- (3) the type of aquifers—confined (artesian) or water table (unconfined).

The type of hydrologic setting cannot be determined until the aquifer units are defined. Aquifer extent and type must be identified from (1) the inventory of wells and springs in the general area (chapter VII), (2) the occurrence of ground water during well drilling or during the exploratory core-boring program (chapters VIII and XVI), (3) water-level measurements (chapter IX), and (4) other sources of geohydrologic information (chapter XV).

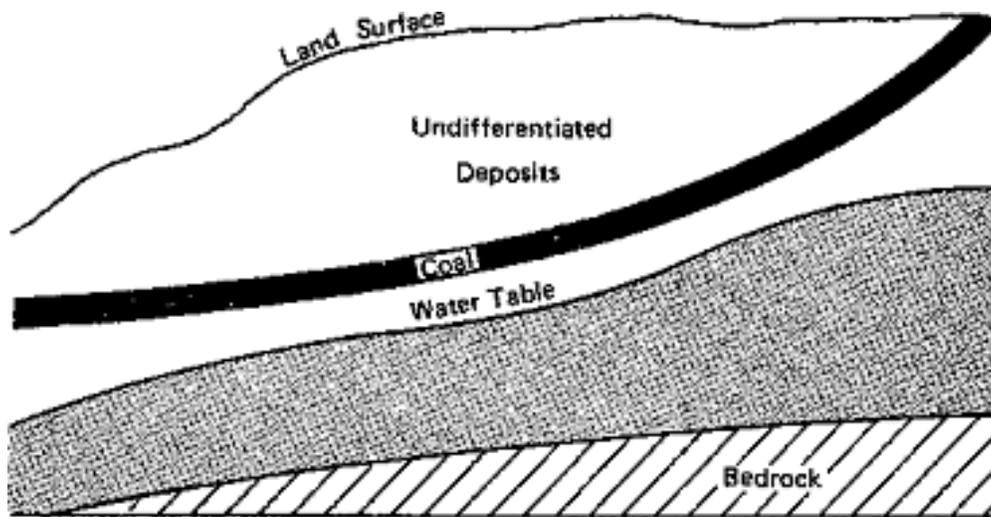
The hydrologic-setting classification system is outlined in table VI-1; each setting is illustrated and described in figures VI-1 through VI-7. This classification system, together with the geohydrologic data, aquifer-test analyses, and other hydrologic information collected, will enable the applicant to identify potential ground-water problems because each setting has certain characteristic hydrologic problems related to coal mining. The applicant will also have sufficient information to design the water supply system necessary to support the proposed mining operation. (Chapters VII through X will describe the analysis and assessment of these problems.)

<sup>1</sup>CFR=Code of Federal Regulations

TABLE VI-1.– Classification for hydrologic settings (HS) of coal beds  
(Examples are depicted in Figures VI-1 through VI-7)

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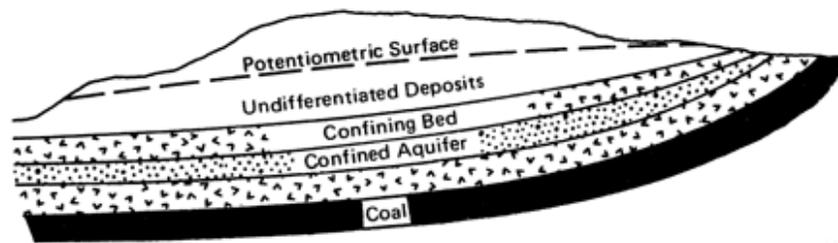
- HS-A. Coal bed above water table—dry conditions
  - HS-B. Confining bed separating aquifer from coal bed—  
dry conditions
    - (1) Confined aquifer above coal bed
    - (2) Confined aquifer below coal bed
    - (3) Water-table aquifer overlying coal bed
  - HS-C. Coal bed in contact with saturated unconsolidated deposits—  
wet conditions
  - HS-D. Coal bed in contact with confined bedrock aquifer—  
wet conditions
  - HS-E. Coal bed in contact with water-table bedrock aquifer—  
wet conditions
  - HS-F. Coal bed is an aquifer—wet conditions
    - (1) Bed is a confined aquifer
    - (2) Bed is a water-table aquifer
  - HS-G. Coal bed within a multilayered aquifer system—  
wet conditions
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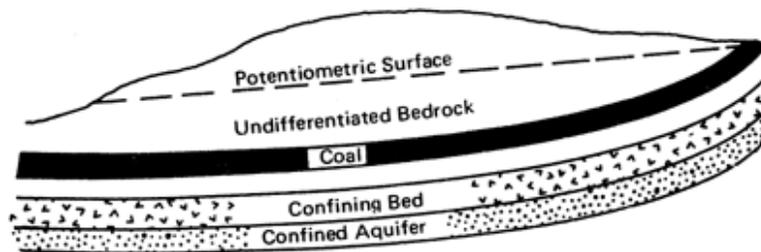
Coal bed unsaturated and above a water-table aquifer.

Seasonal variations could cause the water table to rise to within or above the coal bed, which would change the setting to HS-C. Otherwise the coal bed is generally dry.

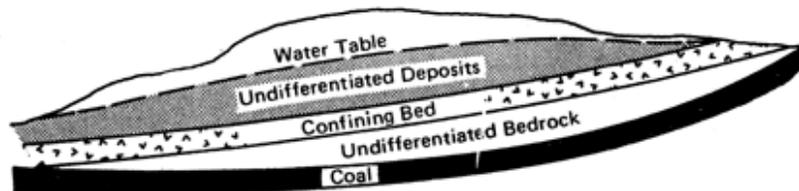
Figure VI-1.— Hydrologic setting for coal bed above water table (HS-A).  
(Modified from Hounslow and Fitzpatrick, 1978, fig. 59)



A. Confined aquifer above the coal bed (HS B(1)).



B. Confined aquifer below the coal bed (HS B(2)).

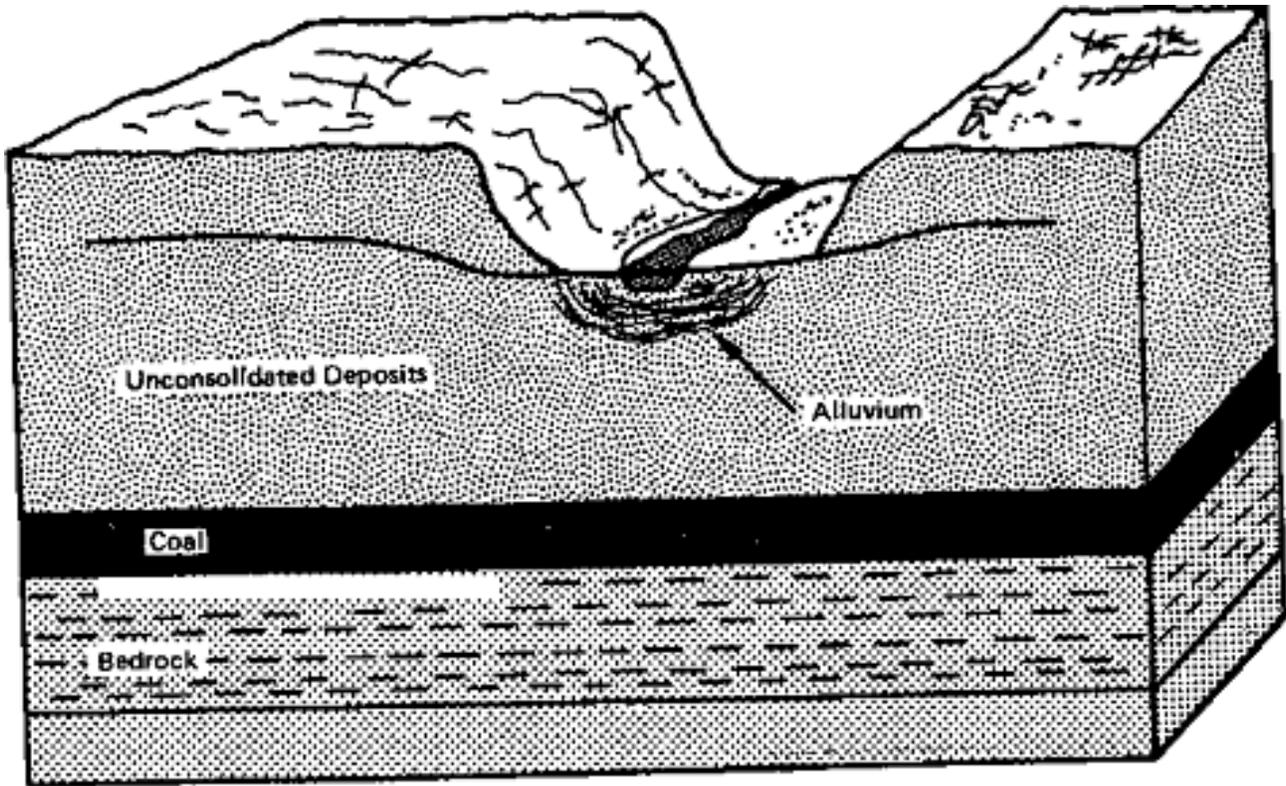


C. Water-table aquifer overlying the coal bed (HS B(3)).

Confining bedrock units, such as shale or clay, in contact with the coal bed to provide a low-permeability barrier between the coal and overlying or underlying aquifers.

The coal bed may be initially dry or wet. If the coal bed is saturated, the coal seam is a confined aquifer and has a setting (HS-F) (figure VI-6). If the confined aquifer overlies the coal bed, the setting is B(1). If the confined aquifer underlies the coal bed, the setting is B(2). If a water-table aquifer overlies the coal bed, the setting is B(3).

Figure VI-2.— Hydrologic setting for confining bed separating aquifer from coal bed (HS-B).  
(Modified from Hounslow and Fitzpatrick, 1978, fig. 59)

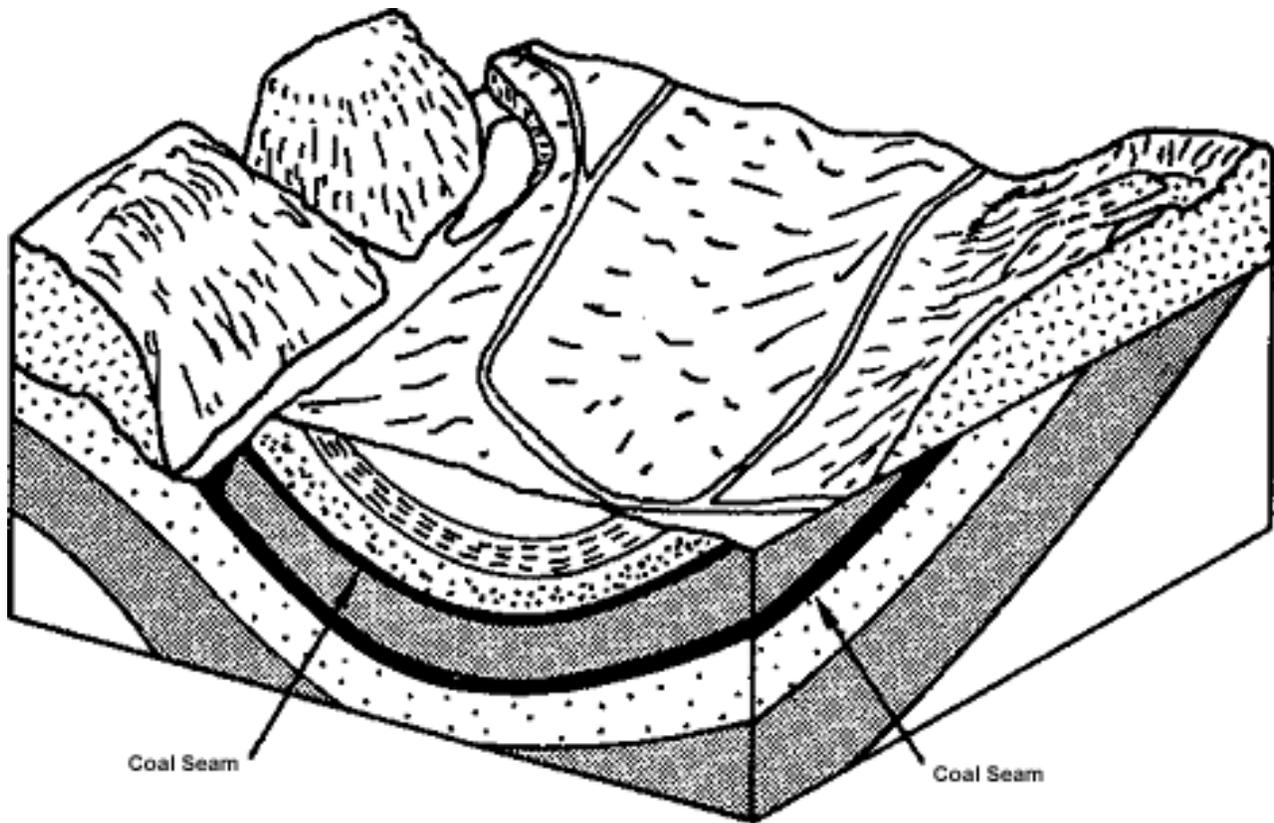


Saturated coal bed in contact with a water-table aquifer composed of alluvial deposits.

Coal-mining operations will be wet.

Figure VI-3.—Hydrologic setting for coal bed in contact with saturated unconsolidated deposits (HS-C).

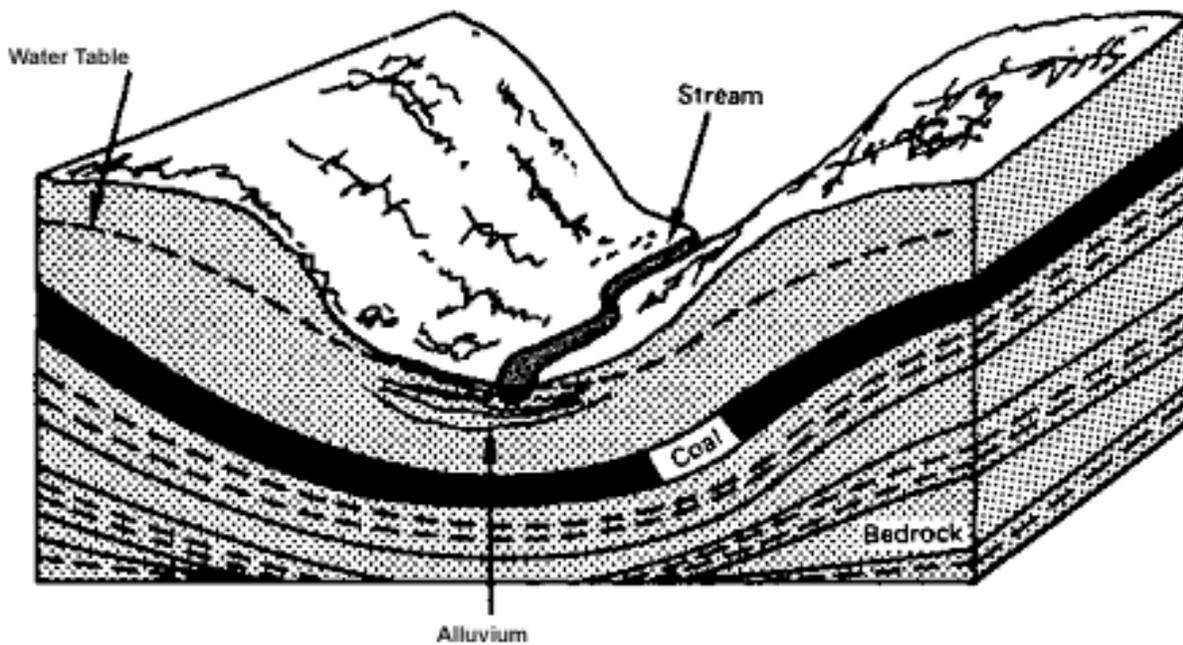
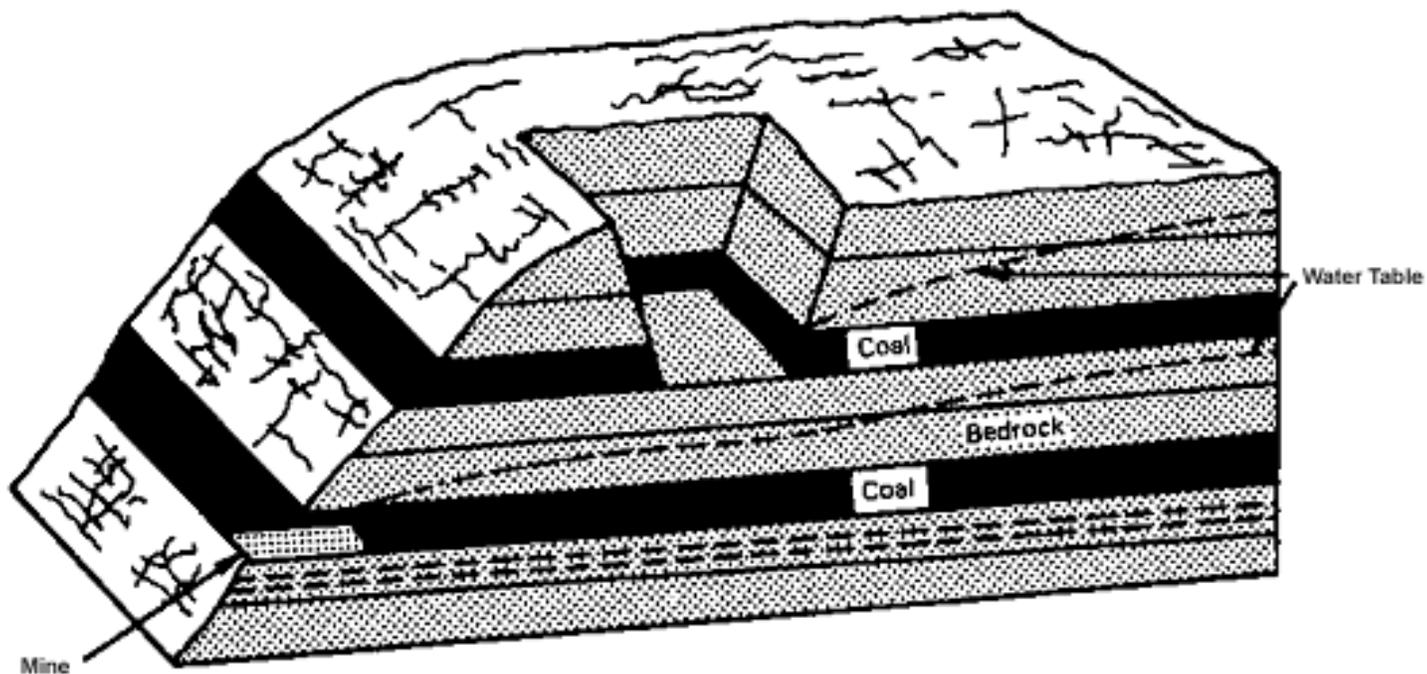
(Modified from National Research Council, 1981, fig. 4.5e)



Saturated coal bed in contact with overlying  
or underlying confined bedrock aquifer.

Coal mining operations will be wet.

Figure VI-4.— Hydrologic setting for coal bed in contact with confined bedrock aquifer (HS-D).  
(Modified from Hounslow and Fitzpatrice, 1978, fig.40)

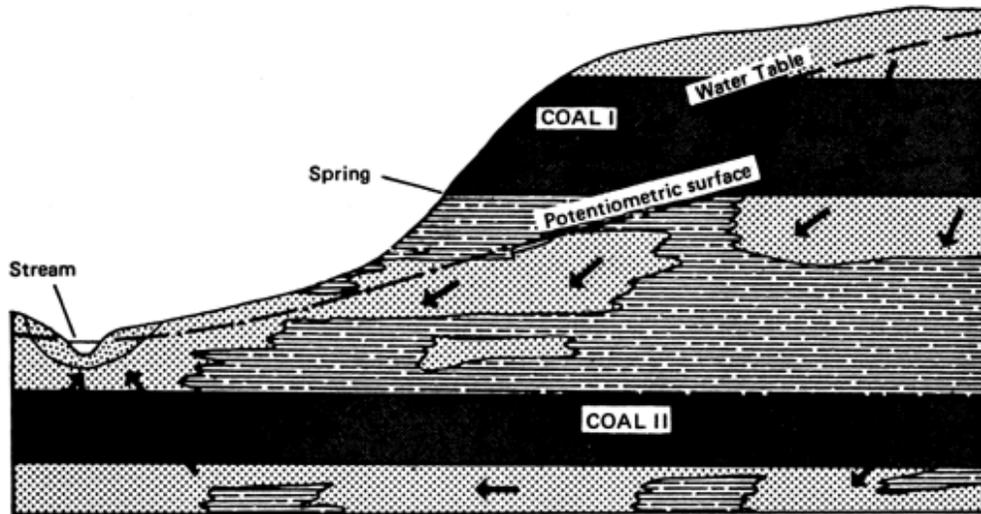


Saturated coal bed in contact with a water-table bedrock aquifer.

Coal mining operations will be wet.

Figure VI-5.— Hydrologic setting for coal bed in contact with water table bedrock aquifer (HS-E).

(From National Research Council, 1981, figs.4.5a and 4.5c)



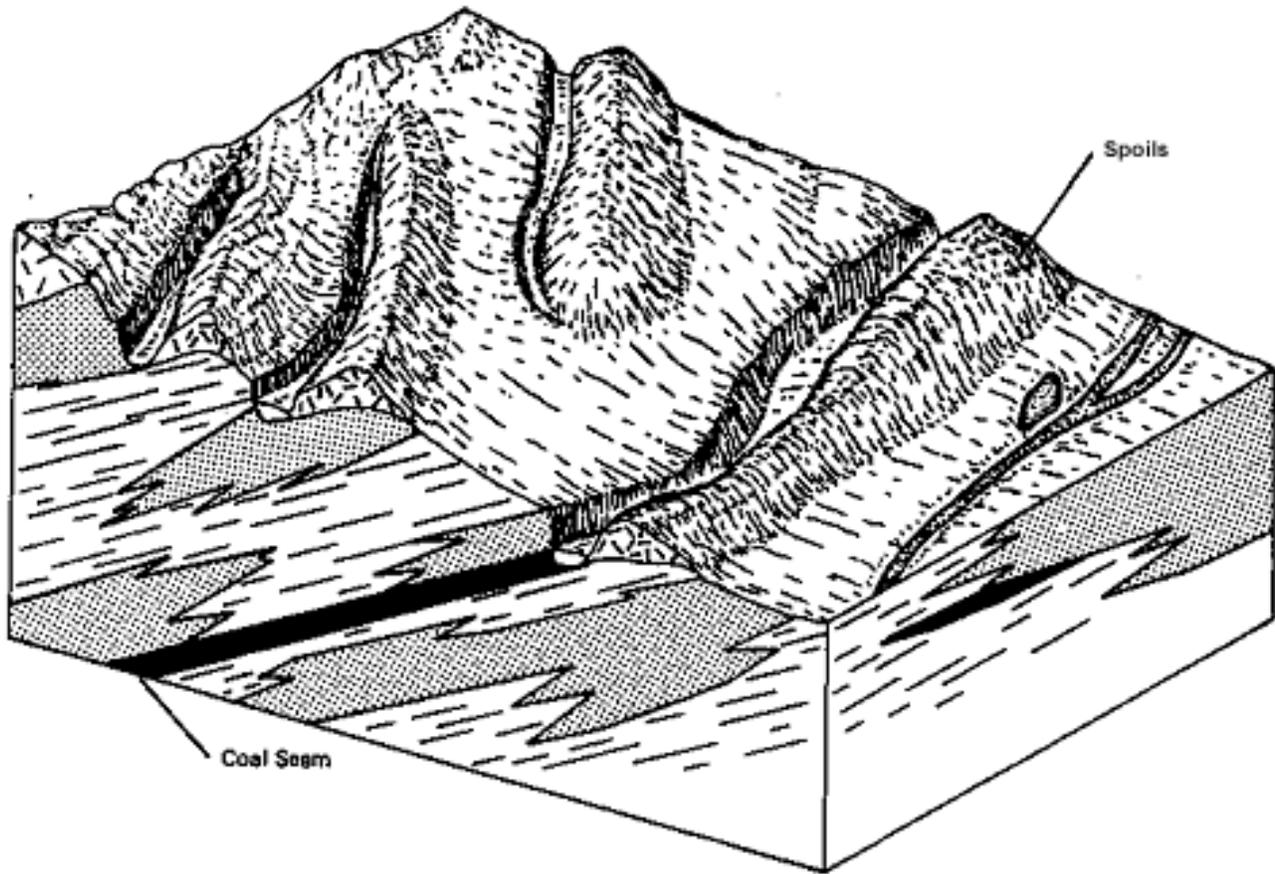
#### EXPLANATION

	Sandstone		Water Table - Coal I [water table aquifer - F(1)]
	Shale		Potentiometric Surface - Coal II [confined aquifer - F(2)]
	Coal		Direction of ground-water movement
	Alluvium		
	Spoil		

Coal bed is an aquifer that may or may not be hydraulically connected to adjacent aquifers.

Setting is F(1) if the coal bed is a confined aquifer; setting is F(2) if the coal bed is a water-table aquifer. Coal mining operations will be wet.

Figure VI-6.— Hydrologic setting for coal bed as an aquifer (HS-F).  
(Modified from Slagle and others, 1981, fig. 10.3-1)



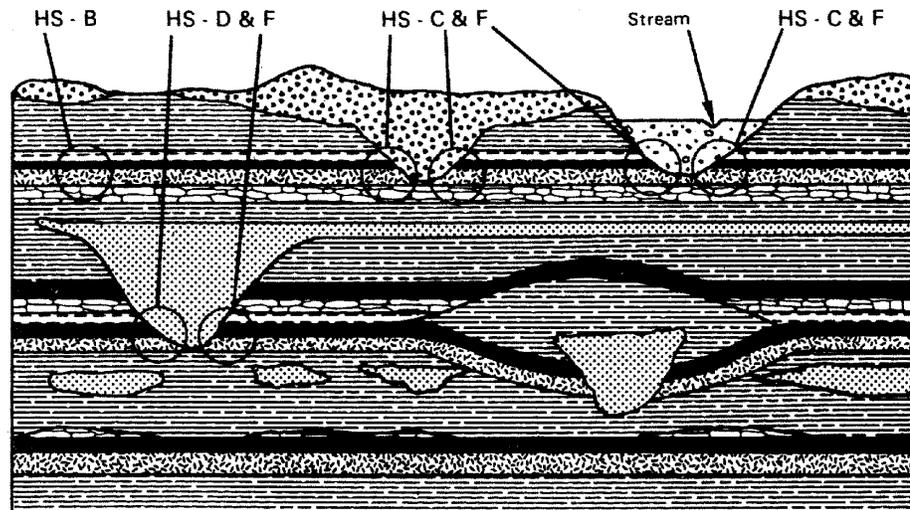
Coal bed within a multilayered aquifer system that consists of differing rock types of variable thickness and lateral extent.

Coal mining operations will be generally wet.

Figure VI-7.— Hydrologic setting for coal bed within a multilayered aquifer system (HS-G).  
(Modified from Hounslow and Fitzpatrick, 1978, fig. 44)

**EXPLANATION**

	Sandstone
	Black shale
	Limestone
	Gray shale
	Glacial drift
	Modern valley fill
	Seat rock (underclay)
	Coal



The hydrologic settings for various mining conditions in geologic settings GS-1 (flat-lying coal bed) and GS-5 or 6 (coal bed under stream valley), are indicated by circles and described below:

HS-B & HS-F, Coal bed is overlain by shale and underlain by seat rock or underclay and probably will be saturated as a result of intersecting joints produced by the bending of the sedimentary rock sequence.

HS-C & HS-F, Coal bed is saturated and in hydraulic contact with modern valley fill and glacial-drift deposits. HS-C at the stream site will present an excavation-dewatering problem because the saturated valley fill (alluvium) deposits are thick and the stream is in hydraulic contact with the alluvium. The valley-fill deposits typically transmit larger quantities of ground water than the glacial drift.

HS-D & HS-F, Coal bed is saturated and in contact with a confined sandstone aquifer. Ground-water flow from small sandstone "washout" deposit will present a short duration dewatering problem. The HS-D setting could have prolonged ground-water flow, owing to the regional extent of the sandstone aquifer. The areal extent of the aquifer would be defined from the coal-resource-evaluation drilling program.

Figure VI-8.— Distribution of coal seams in selected geologic and hydrologic settings. (Detail of Figure III-2c).

(Modified from Cassidy, 1973, fig. 12)