FILE COPY

Ground-Water Hydrology and Geology of the Lower Great Miami River Valley Ohio

By ANDREW M. SPIEKER

GROUND WATER IN THE LOWER GREAT MIAMI RIVER VALLEY, OHIO

GEOLOGICAL SURVEY PROFESSIONAL PAPER 605-A

Prepared in cooperation with the Miami Conservancy District and the Ohio Department of Natural Resources, Division of Water, Columbus, Ohio

US EPA RECORDS CENTER REGION 5
469069

UNITED STATES GOVERNMENT PRINTING OFFICE, WASHINGTON : 1968

about 0.2, a characteristic value reflecting unconfined conditions. In the lower aquifer the storage coefficient probably ranges from 0.02 to 0.0002 and thus reflects varying degrees of confinement by the clay layer.

Most large ground-water supplies in this environment are developed in the lower aquifer, for the upper aquifer generally does not supply enough allowable drawdown to permit high yields. One notable exception is the Middletown Water Works, which has 16 wells in the upper aquifer pumped by suction pumps from a central pumping station (number 20 in present report). This group of wells provides 1-2 mgd of Middletown's total supply of 8 mgd. By thus pumping the supply from a large number of wells, it is possible to reduce the drawdown. Generally, though, an individual well in the upper aquifer should not be expected to yield more than 200 gpm. Specific capacities in the upper aquifer range from 25 to 50 gpm per foot of drawdown.

Wells screened in the lower aquifer can yield as much as 3,000 gpm. Well 2 of the Middletown Water Works, a typical well screened in the lower aquifer, yielded 2,100 gpm with 18 feet of drawdown for a specific capacity of 117 gpm per foot of drawdown.

Separation of the valley fill into two aquifers is distinct in the downtown Middletown area, but it is not necessarily so distinct throughout hydrogeologic environment I-B-1. Clay is generally present in wells drilled in this environment, but it is not always present in a single well-defined layer. Because of the irregular distribution of clay in the section, adequate test drilling is needed prior to development of any large water supplies. Particular care should be taken in both the selection of the proper screen size and the development of production wells.

The clay shown in section *B-B'* (pl. 1) has not been differentiated as to origin; it is believed to be a combination of originally deposited till, till reworked by melt waters, and lacustrine deposits. Generally these different types of clay are impossible to distinguish on the basis of a typical driller's log. The hydrologic significance of clay as a retarding layer, however, remains virtually the same, regardless of its origin.

ENVIRONMENT I-B-2

[Sand and gravel aquifer less than 150 feet thick; clay layers possibly present; stream recharge available]

In most of the Great Miami River valley between Miamisburg and Franklin, and along the valley's east side between Franklin and Middletown, the valley-train aquifer is generally less than 150 feet thick and contains interstratified clay layers. Recharge by induced stream infiltration is available. This hydrogeologic environment is designated I-B-2 (pl. 1) and bears the same relation to environment I-B-1 as environment I-A-2 does to environment I-A-1.

Section *A-A'* (pl. 1), at the O. H. Hutchings station of the Dayton Power & Light Co., shows the distinctive characteristics of this environment. The effective thickness of the aquifer is generally 100 feet or less, although a deep narrow channel just east of the Hutchings station has been identified, and another deep channel west of the power plant has been inferred from seismic refraction surveys. Several clay layers appear to be present, although no single layer is as well defined as the major clay layer which separates the valley fill into two aquifers in the Middletown area.

The coefficient of transmissibility probably ranges from 100,000 to 200,000 gpd per ft in hydrogeologic environment I-B-2. The storage coefficient probably ranges from 0.2 to 0.02, depending on the degree to which the clay layers confine the aquifer. In areas where the lower part of the aquifer is confined by an extensive clay layer, the storage coefficient might be as low as 0.0002.

The range of specific capacities in this environment is great, indicating that the rock materials are not homogeneous. Table 5 shows the results of specific-capacity tests made on the six production wells (wells 7-12) at the O. H. Hutchings station of the Dayton Power & Light Co. The specific capacities range from 59 to 550 gpm per foot of drawdown and average 232 gpm per ft.

TABLE 5.—*Static water level, drawdown, and specific capacity of production wells at the O. H. Hutchings station of the Dayton Power & Light Co., September 29, 1964*

[Discharge of Great Miami River, 282 cfs; river temperature, 68° F]

Well	Static water level		Pumping rate (gpm)	Drawdown (ft)	Specific capacity (gpm per ft)	Water temperature (° F)
	Below measuring point (ft)	Elevation above sea level (ft)				
7	30.4	672.4	1,025	17.4	59	60
8	31.4	671.9	1,045	1.9	550	58
9	30.6	672.7	980	9.4	104	58
10	32.2	669.6	625	4.0	157	61
11	30.1	672.7	1,120	5.2	216	63
12	31.1	671.7	1,145	8.4	136	60

All six wells are within 3,000 feet of each other. The water-temperature range, 58° to 63°F, is somewhat higher than normal for ground water in this area and indicates that induced infiltration from the river has been taking place over a prolonged period of time. Individual wells at the more favorable sites in hydrogeologic environment I-B-2 could probably yield as much as 2,000 gpm with 6-12 feet of drawdown. As in environment I-B-1, production-well sites should be selected only after adequate test drilling, and care must be taken in the development of wells.