

HOW DEPENDABLE ARE THE GROUND-WATER  
RESOURCES OF THE GREATER PHILADELPHIA-SOUTH JERSEY AREA?

By

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The first answer to the question posed in my subject is another question, "Dependable for how much?" Before going into that, however, let's consider some of the basic principles involved. The dependable or safe yield of a water-bearing formation or aquifer, as we call it, is the rate at which it will yield good water indefinitely for human use. The safe yield of an area is dependent upon the capacity of its water-bearing formations to absorb, to transmit, and to store water, upon the availability of water for recharge, and upon the exposure to bacterial or chemical contamination. The smallest perennial yield permitted by any one of these factors can be considered the safe yield. The aquifers in the Greater Philadelphia-South Jersey area should be rated very good to excellent on most of these factors, but not, unfortunately, on all of them.

Aquifers absorb water from precipitation and from streams and other bodies of surface water on their intake areas. The major aquifers in the area are highly absorptive, and large quantities

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of water are available from precipitation and from the Delaware River below Trenton. Neither the capacity to absorb water nor the availability of water for recharge is very likely to limit the safe yield of our aquifers. It might be noted in passing, however, that any water withdrawn in this way from the river reduces the quantity of water in the river by just that much.

Most of the aquifers in the area have relatively high transmissibilities. The quantity of water transmitted, however, depends also upon the slope or gradient of the water table or artesian-pressure surface from the intake area to the point of discharge, and it may not be possible to draw very great quantities from distant sources of recharge. Fortunately our aquifers generally have good recharge facilities near the major points of withdrawals.

The storage capacity of our aquifers is very great, probably about 20 percent of the volume of the aquifers themselves. This great storage capacity will permit wide periodic fluctuations in the rate of withdrawal. Steady withdrawals in excess of the rate of absorption or recharge would, however, be disastrous eventually.

It appears that exposure to contamination, more than anything else, limits the safe yield of the very important aquifers along the Delaware River. The Magothy and Raritan formations, which include some of the major aquifers, contain salt water many miles down the dip toward the Atlantic Ocean. That they contain fresh water in the area along the Delaware River is due to the existence of high-level intake areas northeast of Trenton and southwest of

Wilmington. Excessive pumping along the Delaware River might ultimately cause the salt water to advance up the dip and contaminate the water from these formations. This danger is believed to be remote, however.

A more immediate source of contamination is the Delaware River itself, which lies along the intake areas of some of the aquifers most of the way from Trenton to Delaware Bay. In its lower reaches the river contains salt water which may be, and in some places is being, drawn into the aquifers. Much of the remainder of the river contains water that, although not very salty, is contaminated by human and industrial waste and certainly, is not desirable as recharge water for ground-water supplies. Evidence that recharge from the river does occur may be found in fluctuations in the temperature of the water from some wells and in the quality of the water from many wells on both sides of the river. Numerous wells in Camden and vicinity have increased at least 50 percent in their mineral content in the last 20 years. A group of wells in Philadelphia has recently shown a much more rapid deterioration in quality.

Now for the "how much." Approximately 125 million gallons daily is now being drawn from wells in the area along both sides of the Delaware River. Much of this comes from the Magothy and Raritan formations. It is doubtful if the yield of all the aquifers along the river could be increased by as much as 50 or 75 million gallons daily without drawing almost directly from the

reiver. However, if quantity rather than quality should ever become the primary consideration and if this indirect withdrawal from the river should not be important, it should be possible to increase the yield very substantially.

Finally, the principal reserve of good ground water for the Greater Philadelphia-South Jersey areas is to be found in water-bearing formations southeast of the Delaware River as much as 20 to 35 miles, largely outside the Delaware River drainage basin. In that area, aquifers that are not exposed to contamination are capable of yielding 200 or 300 million gallons of good water each day. These aquifers are still relatively undeveloped. The cost of development will be relatively high but by no means prohibitive. They should be carefully protected for our future needs.