



Ohio Department of Natural Resources Division of Soil and Water Resources Fact Sheet

Fact Sheet 93-20

Ground Water Level Monitoring in Ohio

The Division of Water, Water Resources Section (WRS) is responsible for collecting, researching, interpreting and disseminating hydrologic and ground water resource information for the State of Ohio. An important component of this program is to characterize Ohio's ground water resources through monitoring and evaluating long-term trends in ground water level fluctuations throughout the state's various aquifer systems.

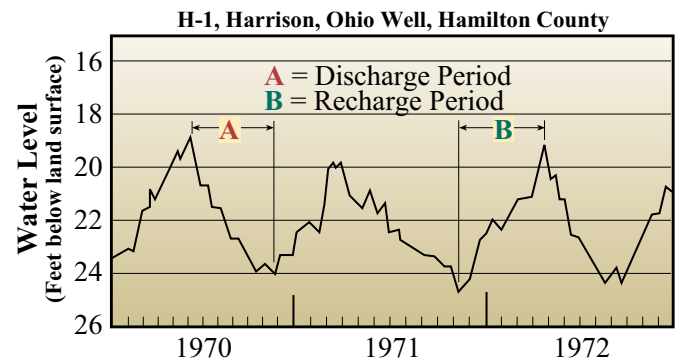
History

Concern about declining ground water levels in the heavily industrialized Mill Creek valley, north of Cincinnati, prompted the Boards of Commissioners of Butler and Hamilton counties in 1938 to obtain the cooperation of the U.S. Geological Survey (USGS) to conduct a hydrogeological study of the area. The first instrument placed on a well to continuously record ground water level changes was in June, 1938 at the City of Wyoming, Hamilton County, wellfield. This well is still being continuously monitored. The next year, 1939, a hydrogeologic study by the USGS was requested by the City of Canton, Stark County, another highly industrialized area. Thus, ground water level monitoring in Ohio had its beginnings.

The ground water level monitoring program continued to expand with the creation of the Ohio Water Supply Board in 1941 and later, the Ohio Water Resources Board in 1945. The Ohio Department of Natural Resources, including the Division of Water, was created through legislation in 1949. The Division of Water became the technical staff for the Ohio Water Resources Board and assumed responsibility to operate and oversee the observation well network. The extent of the observation well network peaked during the early 1970's with 145 wells representing 83 of Ohio's 88 counties equipped with continuous recorders. At present, the network numbers 100 wells representing 51 counties. Throughout this period, as well as currently, the ground water level monitoring program has been a cooperative effort between Ohio and the USGS.

Annual Cycle

Ground water level data collected from observation wells over long periods of time are compiled and summarized on hydrographs. Hydrographs diagram the fluctuation of ground water levels during a given period of time and provide a way of comparing ground water levels from year to year.



The most prominent feature on a hydrograph is the annual cycle, a fluctuation of ground water levels in response to variations in climatic conditions that effect replenishment or recharge of the aquifer.

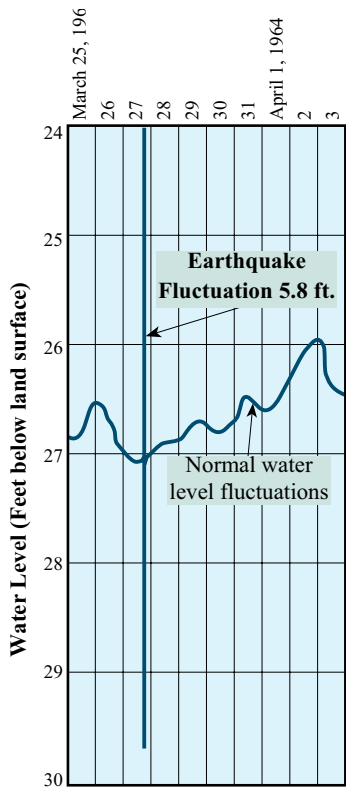
Represented within this cycle are the recharge and discharge periods. The recharge period, indicated by a rise in ground water levels, usually begins in October or November and continues through April or May. During this time, ground water storage is replenished by percolation of precipitation through the soil to the aquifer system or by infiltration from local streams and rivers. Temperatures, and thus evaporation, are low and plants are not growing. This combination allows soils to become saturated, permitting the excess moisture to percolate to the aquifer. In the spring, plants begin to grow and temperatures and evaporation increase. Precipitation is intercepted by the soil and used by plants or evaporates to the atmosphere. This combination promotes the drying of soils. Ground water levels begin to decline because more water is naturally discharged or in other ways is removed from the aquifer than is being replaced. This discharge or depletion condition usually begins in May and continues into the autumn months.

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The timing and duration of the recharge and discharge seasons is contingent on many factors. Droughts and wet periods are the most common variables. Temperatures, soil conditions such as being frozen and variable streamflows are other factors.

Other Interesting Phenomena

In addition to the response of ground water levels to precipitation, many other interesting responses to natural and man-induced phenomena are observed in observation wells. These include such things as atmospheric pressure changes, earthquakes, loading effects from heavy traffic or near by trains, earthtides, impoundment of surface water and pumping (water withdrawal) from wells, quarries and other activities.



The most notable response to an earthquake in an Ohio observation well occurred on March 27, 1964 following the Easter Sunday Anchorage, Alaska earthquake which measured 8.4 on the Richter scale. Observation well Vw-1 (Van Wert County), the most sensitive well in the network to earthquakes, fluctuated 5.8 feet. This fluctuation is caused by the shock waves that radiate out from the earthquake's epicenter. As the shock-waves pass through an area, they cause an alternate compression and expansion of the aquifer material which results in water levels rising and falling an equal amount in the well. Many factors determine if an earthquake will affect a well in Ohio. The quake's location, the geologic formation the well is in, and a minimum Richter scale reading of between 6.5 to 7.0.

Observation wells are often located near municipal well fields and mining operations. With proper interpretation, data from these wells can indicate additional ground water available locally in the aquifer, potential overuse of the

resource, decreases in well efficiency and other aquifer related technical information. Water supply managers, ground water consultants, well drillers, government agencies and others use this information to answer questions about local ground water resources. Since 42 percent of Ohioans depend on ground water for their drinking supply, and about 85 percent of the public water supply systems rely on ground water as their water source, it is important to continue monitoring this resource with observation wells.

Summary

The data collected from observation wells since 1938 is an invaluable tool in the WRS's effort to promote the wise and efficient use of Ohio's rich ground water resources. This ongoing program will continue to shed new light on Ohio's aquifer characteristics, provide documentation in user conflicts and record a historical account of the effects of climatic change on Ohio's ground water resources.

For specific information requests please call:

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