PUMPING TESTS: THE BASICS

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INTRODUCTION

A pumping test involves stressing an aquifer and observing its drawdown response in one or more wells. The first reason to conduct a pumping test is to determine the maximum safe yield of a pumping well or a group of pumping wells. The second reason is to help ensure that other users of the aquifer or other nearby water resources (wetlands, etc.) are not negatively affected by the pumping. For public water systems, a pumping test is also important to characterize water quality, including determining whether the groundwater source is under the direct influence of surface water. Wellhead protection areas can also be defined using pumping test data.

Figure 1. Pumping test near Dryden, NY (from USGS Scientific Investigations Report 2013–5070).

PUMPING TESTS FOR WATER WITHDRAWAL PERMITS

Recently, the NYSDEC updated their procedures for pumping tests that must be conducted as part of any application for a Water Withdrawal Permit involving new groundwater sources or a reassessment of previously permitted wells. A Water Withdrawal Permit is required for any system that has the capacity to withdraw 100,000 gallons per day (69.4 gallons per minute). Note that the capacity or permitted "taking" is determined by summing the maximum potential withdrawal rates of all the system's water wells, not the actual or anticipated average withdrawal rate.

The pumping test protocols for a Water Withdrawal Permit call for pumping at a constant rate for a minimum of 72 hours, with water levels measured in the pumping well, observation wells, and surface water. Under ideal conditions, the test continues until the drawdown has stabilized in the pumping well for at least six hours. Water level measurements are not only taken during the test, but also for a week before the test and at least 12 hours after pumping has ceased. During the pumping period, the output of the pump must be monitored frequently and kept within ten percent of the test pumping rate, particularly within the first hour of the test. If the pump (or generator) fails, the test would have to be extended or it may have to be repeated. Incidentally, the pumping test must be done during a time of normal or below normal stream levels and not during periods impacted by spring recharge. Therefore, tests are usually not conducted during the months of March, April, or May.

PUMPING TESTS FOR OTHER PUBLIC WATER SYSTEMS

For public water systems that do not have to apply for a Water Withdrawal Permit (have a capacity to withdraw less than 100,000 gallons per day), the pumping test standards in Appendix 5-D.4 of Subpart 5-1 of the State Sanitary Code would pertain. For community water systems or non-transient, non-community water system wells that are less than 200 feet from surface water or are constructed in bedrock, the duration of the pumping test should be 72 hours with a minimum of six hours of stabilized drawdown (if possible). For wells located in sand and gravel aquifers, a minimum test duration of 24 hours with a minimum six hour stabilization duration period is allowed. The test is to be conducted at a pumping rate at least equal to the design rate based on system demand.

For transient, non-community water systems, the standards in Appendix 5-B.4 of Subpart 5-1 of the State Sanitary Code would pertain (these are part of the standards for all water wells used for drinking, culinary and/or food processing purposes). Appendix 5-B.4 requires only a minimum four hours of stabilized drawdown while pumping at a constant flow rate. Neither Appendix 5-B or 5-D of the State Sanitary Code requires monitoring of observation wells or surface water.

IN CLOSING

Pumping tests provide valuable information for determining well characteristics, principally its long-term safe yield. They are a requirement for the permitting of new wells or a request for an increased withdrawal of water. For hydrogeologists like myself, they can also provide critical aquifer information that can be used to define the area that contributes groundwater to the well.

If you would like to learn more about pumping tests or have questions, feel free to reach out to me anytime at 1-888-NYRURAL, ext. 170 or at winkley@nyruralwater.org.