WATER LEVEL LOGGERS

By Steven Winkley

Introduction

Whether required to or not, it is important to know what the water levels of your aquifer or reservoirs are. I increasingly see the need for systems to take such measurements. A direct means of measuring such levels include a water level meter/indicator for groundwater and a staff gauge for surface water. However, the method to record water level fluctuations automatically is now often done using an indirect means known as a water level logger. Most commonly, a water level logger is a series of devices packaged together in a waterproof assembly that includes a pressure transducer, a battery, digital circuitry, memory, and communication components. Note that there is also a different type of water level logger that I will discuss at the end of the article that uses acoustic (sound) waves to measure water levels rather than a pressure transducer.

The Basics

A pressure transducer is a measuring device that converts the applied pressure from the water column into an electrical signal. In turn the water level can be calculated from the water pressure. Water level data is stored in the logger's memory and can be downloaded using software or can be collected by other means such as a smart device app, telemetry, or other system.

Unless vented to the atmosphere, pressure transducers measure a combination of the water pressure plus the atmospheric (barometric) pressure. A correction must be made by subtracting out the barometric pressure from the total measured pressure to determine the water pressure alone. This can be done using data from a barometric pressure datalogger on-site or from a local weather station. Non-vented loggers are deployed using a wireline, cord, or a direct-read data cable. Alternatively, some water level loggers are vented to the atmosphere through the attached communication cable. These types of sensors directly measure water pressure only.

Deployment

Using software, water level loggers are programmed to stop, start, and record levels at a specified interval. Thus, during a pumping test for example, measurements can be taken more frequently during the early periods of the test and at gradually longer intervals as the test progresses. The number of water level readings that can be stored in the logger depends upon the deployment period and the measurement frequency. Most units can store 100,000's of data points or more if the battery lasts. The lithium batteries on most current units typically last 5 to 10 years.

There are different ways to download the water level data from loggers. The most conventional way has been to retrieve the logger from the well or other deployment location. Data is then downloaded typically using an optical reader. Alternatively, some loggers can be connected to a direct read cable so that the unit does not have to be raised and lowered out of the water to be read. A laptop computer or other readout device is connected to the data cable, and the data is downloaded.

In recent years other technologies have emerged to get water level measurements from loggers in real time. Telemetry systems utilizing cellular communication can be used to transmit water level data wirelessly from the field to a PC and/or a smart device. This application may be particularly viable for water systems for their new supply wells. In addition, Bluetooth® wireless technology can now be installed at logger deployment locations. Using apps on mobile devices, Bluetooth® technology is used to communicate with loggers, including downloading data, adjusting logging times, etc.

Sonic Water Level Measurement and Logging

An alternative technology to pressure transducers is sonic or acoustic water level measurement. This methodology works by transmitting a sound wave into a well or pipe and measuring the time it takes for the sound pulse to return after contacting the water surface. Some sonic water level measurement devices can log measurements much like a pressure transducer-based logger does. This type of technology eliminates concerns over lowering devices into wells (and getting them stuck), well contamination issues, etc.

Final Thoughts

Water systems should strongly consider collecting water level measurements at your water sources. A means to accomplish this is the use of water level loggers. Such devices will save time and result in high quality data that should prove especially useful to track changes in source water availability. If you have questions, please contact me at 1-888-NYRURAL ext. 170 or through email: winkley@nyruralwater.org.

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