

Pumping Wells for Sustained Productivity

Introduction

Water utilities large and small, burdened by the need to meet the demand for potable water, sometimes operate supply wells on full-time schedules with few or no times of cessation in pumping. This is all too common in developing countries where infrastructure is often limited; however, one does not have to look hard to find examples of this practice in many communities in the U.S. In the short-term, full-time operation of wells may satisfy the immediate supply demand, but the long-term consequences of this practice can be dramatic, as discussed in this technical memorandum.

Loss of Pumping Capacity

If a well is pumped continuously for long periods without cycling on and off, the specific capacity (i.e., rate of discharge per unit of drawdown) will decline. When a well is pumped, fine sediment from the aquifer moves into the filter pack and often remains there. Over time, the sediment builds up in the filter pack and reduces the inflow to the well. This then leads to an increase in drawdown, reduced production, and reduced specific capacity.

Pump Cycling

The phenomenon of constant pumping and reduced specific capacity is well known but not well understood. Low yielding and high yielding wells alike have been known to clog with sediment if they are operated continuously. However, experience shows that if pumping is stopped periodically, the tendency for the well to clog is reduced. In fact, some operators intentionally cycle their wells on and off several times per day for this very reason. Anecdotal evidence supports this tactical approach to operation.

Periodic Surging

As with most things that work for awhile, too much of a good thing often diminishes the effect(s). So it goes with wells too. Cycling a well on and off is effective, but there is no one operational scenario that is "bullet-proof". Therefore, well operators need to choose a pumping schedule, see how it works, check the results over time, and adjust the scenario until the desired results are achieved. Naturally, this has to take place while considering the need to meet the local demand.

Rehabilitation

If a downward trend in specific capacity is observed by the operator, then rehabilitation would be an appropriate response. Sometimes, mechanical surging may be enough to agitate the filter pack and free sediment that has collected. As a rule of thumb, if the specific capacity has reduced by 50%, the chances of fully restoring the well to its original specific capacity are slim.

Summary

Proactive cycling of production wells is always encouraged as a simple approach to maintaining the operational character of a well. Constant pumping for long periods of time should be avoided.

About the Author

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References

Handbook of Ground Water Development, 1990, Roscoe Moss Company, John Wiley and Sons, New York, NY