

How to Close an Abandoned Well

Steve Higgins and Sarah Wightman, Biosystems and Agricultural Engineering

Abandoned wells are often the only structures remaining after an old house or barn has been removed (Figure 1). If left unmanaged in agricultural areas, these abandoned wells can pose a serious threat to livestock and human safety because of the large surface openings they often have.

Abandoned wells can also affect water quality, as the shaft that forms the well creates a conduit directly into groundwater resources (Figure 2). If wells are not closed properly, pollutants present on the surface, including sediment, manure, and pesticides, can be transported through stormwater runoff into the groundwater through that conduit (Figure 3). Water quality is also negatively impacted when livestock fall into these openings or the openings are used as a way to dispose of dead livestock (Figure 4).

Landowners can be held liable for groundwater contamination originating from a polluted well, just as they can for accidents caused by an abandoned well.

The goal of this publication is to provide information on the proper way to close an unused well, which will help prevent accidents and protect drinking water.

Locating Abandoned Wells

There are several types of wells that can be found on agricultural properties, including drilled wells, wells with multiple casings, bored and hand-dug wells, driven wells, and flowing artesian wells.

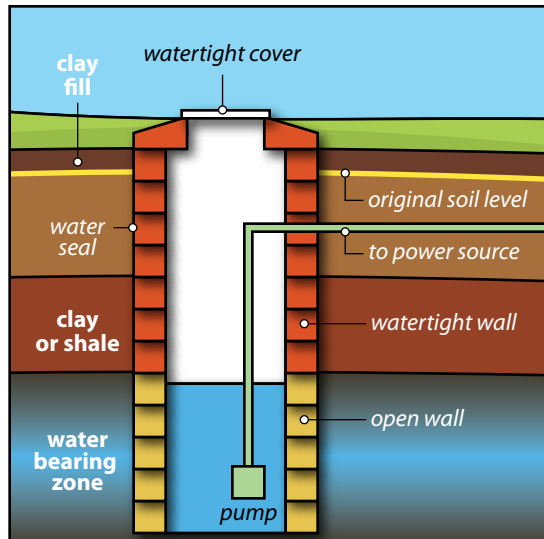


Figure 1. This properly functioning well could become a hazard if abandoned.

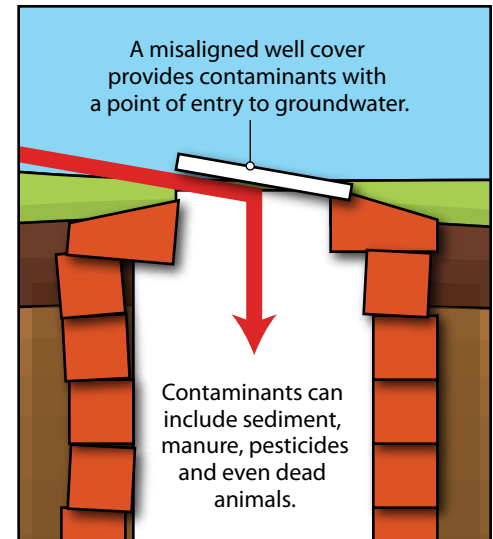


Figure 2. This abandoned well has an open side, which makes it possible for pollutants to enter the aquifer unabated.

To locate an abandoned well, search old photographs, fire insurance plan drawings, health department records, and water utility records. Also, ask neighbors and former property owners for information. Look for well casings, waterlines, pressure tanks, pumps, and electrical components such as wiring in the yard or basement or near old windmills or pump houses. Metal detectors can help locate metal casings.



Figure 3. This abandoned well is located in an agricultural area that is void of vegetation that could filter pollutants from stormwater runoff and reduce the amount of pollution entering groundwater resources.



Figure 4. This well's large opening could be hazardous for nearby livestock.

A Kentucky certified monitoring well driller may decommission an abandoned well, but only after obtaining a water well abandonment variance from the Kentucky Division of Water (DOW). A directory of certified drillers can be found on DOW's website (<http://water.ky.gov>) by clicking on *Programs* and then on *Well Drillers Certification Program*.

Preparation

Measurements

Before closing a well, measurements of the well depth, diameter, and its depth to static water level need to be taken and recorded in the Uniform Kentucky Well Maintenance and Plugging Record.

Obstructions

All obstructions must be removed from the well before closure. If the pump or other equipment, such as casing, screens, or liners, is stuck in the well and cannot be removed, the certified driller should push the material to the bottom of the well.

Disinfection

Closing out a well requires that it must be disinfected in accordance with administrative regulation (410 KAR 6:310 Section 9 [3]). To disinfect a well, determine the correct amount of chlorine or hypochlorite granules to be used and pour it into the well (Table 1). Circulate the chlorine solution throughout the well for at least 30 minutes, ensuring that the chlorinated water contacts all parts of the well casing, borehole, discharge pipes, and all internal well components. Allow

Table 1. Guidelines used to determine the amount of disinfectant that would provide a minimum chlorine concentration of 100 parts per million in the well.

Well Diameter (inches)	Chlorine Bleach (cups/feet of water)	Hypochlorite Granules (ounces/feet of water)
4	3/150	2/150
6	3/75	2/75
8	3/50	2/50
24	8/10	5/10

the chlorinated water to stand in the well for at least 30 minutes, then purge the well of all chlorinated water. Make sure the chlorinated water is discharged to the ground and not to a drainage ditch, stream, pond, lake, or wetland.

Well Casing, Screen, and Liner Removal

Well casing, screens, and liners must be removed from the well before sealing it. If the well casing has been grouted in place and the certified well driller is unable to remove the casing, the certified well driller may cut off the casing a minimum of 5 feet below the ground surface. For wells with multiple casings, the certified well driller should first remove the innermost well casing, screen, or liner. The well should then be filled up to the bottom of the next outer casing before removing that casing, and so on with any other casings. If necessary to avoid borehole collapse, the well casing, screens, and liners may be removed at the same time sealing material is introduced.

Sealing Material Placement

The filling of the well is designed to prevent migration of surface water or contaminants to the subsurface and to prevent migration of contaminants along water-bearing zones. Use Table 2 to determine what sealing material should be used to fill any type of well at a given depth. These materials can be used singularly or in various combinations to properly abandon the well. Under no circumstances should waste materials (used concrete, asphalt, etc.), or biodegradable wastes (woody materials, brush, etc.) be used to seal a well. If you have questions concerning proper sealing material, please contact the Kentucky Division of Water.

If the well has a void, the certified well driller should fill the well with sealing materials or other inert materials from the bottom of the well to at least five feet below the void. A packer, expansion bridge, or other support should then be placed at the top of the void, and a permanent bridge of at least 10 feet of sealing material should be placed above the expansion bridge. After dealing with the void, filling can proceed as indicated in Table 2, using the top of the void as the new bottom of the well.

Flowing Artesian Wells

Flowing artesian wells are wells in which there is upward movement of water between aquifers. Plug these wells with neat cement grout, which is generally formulated using a ratio of one 94-lb bag of portland cement to no more than 6 gallons of water. Pump the neat cement ground under pressure and mix with the

Table 2. Sealing materials recommended based on well type and depth.

Well Type	Depth		Top 5 Feet
	From Bottom of Well to 20 Feet Below Ground Surface	From 20 Feet Below Ground Surface to 5 Feet Below Ground Surface	
Drilled	Sealing materials, inert materials	Sealing materials	Sealing materials, clay, inert materials suitable to proposed land use
Multiple casings			
Bored and hand-dug	Sealing materials, dense grade aggregate limestone, sand, or native clay		Clay, impermeable materials suitable to proposed land use

Note: Sealing materials commonly consist of natural rock fragments, sand, gravel, cement, bentonite, cement/bentonite mixtures, and in some cases, clean soils.

minimum quantity of water to facilitate handling. The driller may restrict artesian flow if necessary. After plugging the well with grout, the driller should place a well packer, cast-iron plug, or temporary bridge made of wood or neoprene at the bottom of the confining formation immediately over the artesian water-bearing horizon to seal off the flow.

Reporting

Within 60 days of closing a well, the certified well driller must complete and submit a Uniform Kentucky Well Maintenance and Plugging Record to the well owner and to DOW.

References

- Kentucky Administrative Regulations: 401 KAR 6:310 Section 1.
- Fleck, Allison. (2011). "Plug Abandoned Wells Properly to Protect Groundwater." *Land, Air, and Water*, 22(2):13. Available at: <http://eec.ky.gov/Land%20Air%20%20Water%20issues/Spring%202011.pdf>
- Commonwealth of Pennsylvania. 2001. *Groundwater Monitoring Guidance Manual: Chapter 7, Well Abandonment Procedures*. Department of Environmental Protection: Bureau of Watershed Management. Available at: <http://www.elibrary.dep.state.pa.us/dsweb/Get/Version-48361/383-3000-001.pdf>