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SEALING ABANDONED WELLS

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Unused or abandoned wells are a common site throughout Alabama. These wells pose a potential threat to groundwater, which supplies at least half of Alabama's population with drinking water. It is easy for contaminants to follow the path of these wells directly into our groundwater supply, bypassing the normal filtration that occurs through soil. Common sources of contamination include farm wastes, spills, leaking fuel storage and other chemical tanks, septic system wastes, and stormwater runoff.

It is not unusual for people to accidentally pour hazardous waste such as used motor oil into abandoned wells, or purposely use them as a garbage dump without realizing the potential hazard. This is another reason to properly seal unused wells.

Seepage through old abandoned wells may contaminate the water for new wells. When an aquifer becomes contaminated, cleaning it up can be very difficult and expensive.

Larger diameter, open and unused wells also present a physical hazard for small animals and children. Even adults have fallen into open, unused wells.

More and more old wells are becoming a liability in resale of land.

Locating Old Wells

Unused or abandoned wells can be found almost anywhere. In cities and towns many homes still have old wells that were used before city water was installed. These may be dug, bored, drilled or sand-point wells, but most of them are no longer in use.

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ALABAMA A&M AND AUBURN UNIVERSITIES, AND TUSKEGEE UNIVERSITY, COUNTY GOVERNING BODIES AND USDA COOPERATING

Dug and bored wells were once the most common types of wells in rural Alabama. Some of these can still be found around homesites that have long since been abandoned. The more affluent farms had several wells. Some were equipped with windmills or hand powered piston-pumps for lifting the water, but most had buckets on ropes attached to hand cranks.

As electric power was extended to rural areas, pumps and piping replaced the wind and human-powered systems and drilled wells became the norm. Many farmstead wells of all types are still in use and conveniently located near septic systems, barnyards, gasoline storage tanks, and chemical storage areas. This increases the danger of contamination to groundwater. All unused wells and those wells that pose a special threat to groundwater or present other hazards should be properly abandoned and sealed.

Proper Steps for Well Abandonment

There are a number of steps that should be followed to properly abandon and seal an unused well. Different types of wells require different abandonment techniques, materials, and equipment.

In some cases, you may qualify for cost-sharing aid. See information below under Cost Share Assistance.

Step 1—Determine the Type of Well. Different techniques, materials and equipment will be required to properly abandon a well, depending on its diameter, depth and type of construction. There are at least four general types of wells found in Alabama; *dug wells, bored wells*, *driven (sand-point or jetted) wells*, and *drilled wells*.

In colder climates, a drilled or driven well may be located in the bottom of a pit. This is called a *pit well*. These pits may be 6 to 8 feet in diameter, greater than 5 feet deep, and house the plumbing to protect it from freezing. The top of the well is located in the bottom of the pit. The pit is usually lined with stone and mortar or cement. In the spring time the pit is usually filled with water. This well design is not common to Alabama.

Dug wells. Dug wells are usually large diameter wells that extend down below the water table. These wells were dug by hand and commonly have a diameter in the range of 3 to 5 feet, although some may have a diameter greater than 10 feet. They may extend down into bedrock that was blasted or chipped out to reach the aquifer. The sides of most dug wells are cased with tile, stone, brick or concrete walls, commonly called "curbing" to hold the soil back. Some of the larger diameter wells however, may have no casing at all. Dug wells usually range from 15 to 50 feet in depth.

Bored wells. Bored wells get their name from the fact the hole is made with an earth auger. Like dug wells, these wells extend down below the water table and are seldom deeper than 100 feet. Older wells dug with hand augers are usually not more than 8 to 14 inches in diameter, but power augers are widely used now. Wells dug with power equipment may

be as large as 3 feet in diameter. These wells are usually lined with drain tile as the holes are bored.

Driven wells. Driven wells are common in sandy areas and often called driven-point or sand-point wells. These wells are usually small diameter steel pipe, 1.25 to 2.5 inches in diameter, with a perforated screen and steel point at the bottom. They are pounded down into the ground to the depth of the aquifer, usually a shallow water table aquifer. Driven wells are limited to areas where water-bearing sand or gravel lies within 25 to 100 feet of the surface, and where there are no rocks or boulders to interfere with driving the pipe. If the water table is below 25 feet the well must be large enough for a submersible pump.

If a water jet is used in the driving process the well may be called a *"washed or jetted well*." These wells may range up to as large as 14 inches in diameter.

Drilled wells. Drilled wells usually have a steel pipe (casing) from 4 to 20 inches in diameter, depending on what they were used for. A few may be larger than 20 inches but most range from 4 to *8* inches in diameter. These wells were installed with either a percussion or rotary drilling rig and are usually quite deep, sometimes passing through several layers of gravel and rock to reach an adequate supply of clean water. Common depths may range from 30 to 40 feet to over 1000 feet.

Step 2—Check on Cost-Sharing Assistance. The well may qualify for cost-share assistance. The Agricultural Stabilization and Conservation Service (ASCS) issued Notice AC-313 on October 21, 1993, entitled WP8, Plugging Abandoned Water Wells.

The maximum cost for the practice is 75 percent of the total cost not to exceed $1,000 per well. The practice shall be maintained for a minimum of 10 years after the calendar year that the well is plugged.

There is no national standard for WP8 from USDA on plugging abandoned wells at this time, but the practice is authorized if there is an interim SCS standard under Technical Code 997, or if special design and specifications have been approved, by the appropriate state level SCS officials. State SCS officials have established such specifications.

The following *policies* apply to WP8, Plugging Abandoned Wells.

1. Abandoned water wells must be plugged according to Federal, State, and local health and environmental standards.
2. Priority shall be given to wells that are contaminating aquifers used for drinking water.
3. This practice is only authorized for drilled or hand dug abandoned water wells.
4. This practice is not authorized for water wells drilled at an oil or gas drilling site to supply water for drilling activities.
5. Newly abandoned wells where State laws require that such wells be plugged are ineligible for cost-share assistance.

The *participant must:*

1. Agree to allow USDA agents access to the site to review and evaluate the practice.
2. Secure all necessary permits, if required, without cost-share assistance before starting construction of the practice.
3. Provide a copy of any forms, logs, or reports required by Federal, State, or local well plugging laws to the designated USDA technician as part of the practice completion certification.
4. Ensure that the surface area disturbed during practice establishment is seeded to vegetative cover without cost-share assistance.

Authorized Costs. Authorized costs apply to the following:

1. Labor costs to remove pumps, associated piping, ungrouted liner pipe, and other obstacles that must be removed before the well is plugged. **(Note:** All debris must be disposed of according to State and local laws and regulations.)
2. Chlorine used for disinfection.
3. Fill material needed to fill the well such as gravel, sand, or clay.
4. Sodium bentonite or other grouting material to seal the well cavity.
5. Cement or other material used to cap the well.
6. Costs to back fill the well with surface materials or similar materials to the surface.
7. Necessary labor costs to plug the well.

Unauthorized Costs. Cost sharing is not authorized for the following:

1. Plugging test or exploratory wells or holes. **(Note:** These are considered the responsibility of the landowner and should have been properly plugged immediately after completion of all testing, sampling, or other operations for which the well or hole was originally intended.)
2. Plugging driven (punched) water wells. **(Note:** These are wells in which the screen section of the casing is driven into the water formation.)
3. Plugging oil or gas wells.
4. Fees charged for water quality testing.

Step 3—Determine Well Dimensions. It is important to check well dimensions so that the appropriate amount and type of fill material is on hand once the sealing process begins. This is especially true for driven wells, drilled wells and any other wells that are filled from the bottom up. For best results, the filling process should be completed in a single operation. This may require the assistance of a professional well contractor or pump installer.

It is important to measure the exact depth and volume of drilled wells because they can vary so much in depth. Many of these wells have a drilling history and exact specifications with the state geological survey, because they were most likely drilled by licensed water well drillers. Current measurements should correspond closely with recorded

specifications. For information on drilled wells in Alabama, contact the Water Resources Division of the Geological Survey of Alabama in Tuscaloosa at 205/349-2852.

Step 4—Remove Debris and Piping. All debris and piping should be removed from a well before filling.

Step 5—Check for Contaminants. If the well has been abandoned for an unknown period of time and the history of the well is not known, the well should be checked for contaminants. Waste oil is a common product found in narrow" diameter driven wells and some bored and drilled wells. Garbage is a common product in larger diameter bored and dug wells. Special equipment may be needed to sample and/or remove contaminants from these wells.

Step 6—Select and Stockpile Appropriate Fill and Sealing Materials. There are several substances that can be used in filling and sealing abandoned wells. Appropriate fill material depends on the type of well, and may include crushed stone, gravel, sand, silt, clay, native soil or even agricultural lime in some situations. Bentonite, a natural clay material mined in several areas of the United States, is the most common type of clay material use as both a fill and sealing material in certain types of wells. Un-hydrated bentonite chips have the capacity to absorb water and swell up to 12 or 13 times their normal volume. There are different sizes of bentonite chips which are suited for different situations. Fifty-pound bags of bentonite cost about $4 to $5. other sealing materials may include concrete, cement grout, neat cement, or neat cement with additives such as gypsum or aluminum powder.

Mixed cement grout, grout, or cement grout are names used for a mixture of pure Portland cement and water that is mixed at a ratio of 6 gallons of water to one 94 pound bag of cement. Depending on the well, the cement product may be poured directly into the well or pumped through a conducting pipe, filling the well from the bottom up. Since filling a deep well may require special equipment, it is advisable to seek the help of a certified well driller.

Step 7—Filling and Sealing the Well. Each well is unique, and special attention should be given to filling and sealing it properly so that it does not cause any future problems or additional expense.

Dug Wells. For dug wells larger than 30 inches in diameter, clean native soil, silt, or clay may be used as the fill material. Dug wells less than 30 inches in diameter should be filled with bentonite chips or a mixed cement grout pumped to the bottom through a conductor pipe. Professional help may be needed. If a dug well of any size extends down into the bedrock, the rock portion of the well should be filled with cement grout through a conductor pipe. The top 3 to 5 feet of curbing should be removed after the well is filled to within 3 to 5 feet of the surface. If it can be broken with a sledge hammer it can be used as part of the fill material. This top 3 to 5 feet should be filled with native soil material.

Bored Wells. Bored wells should be handled the same as dug wells less than 30 inches in diameter.

Driven Wells. Driven wells 2.5 inches or less in diameter should be filled with cement grout poured through an appropriate sized funnel. Water will be forced out the top as the well is filled. If the well is less than 25 feet deep the pipe and point can usually be removed and the hole alone filled with cement grout. If the pipe has a concrete floor around it this should be broken up with a jack-hammer or sledge and removed so the pipe can be pulled out. In driven pit wells, the pipe and point should be left in place and filled with cement grout. The concrete in and around the pit should be broken up with a back hoe and the area filled with native soil material that is less permeable to infiltration than the surrounding sandy soil.

Drilled Wells. Proper abandonment of drilled wells depends on the diameter and depth of the well. Technical assistance is often required when dealing with a drilled well. Generally, the sealing of a drilled well will not require removal of the casing.

Drilled wells 4 inches or more in diameter can be properly filled and sealed with bentonite chips or cement grout. A conductor pipe will be needed to deliver cement grout to the bottom of the well. If the well is filled with bentonite chips, the chips should be poured on a downward slope across a coarse mesh screen directly into the well. The filling rate should be. about 3 minutes per 50-pound bag.

If a screen is not used or the pouring rate is too rapid, "bridging," or the formation of a gap between the sealed area and non-sealed area may occur. Bentonite dust material can sometimes float on the water, instantly harden, and cause bridging, or pouring too quickly can result in partial filling, which also causes bridging. The volume of the well determines the amount of chips to be used. Calculating this number exactly can serve as a safeguard. If there is a large amount of bentonite chips left over, then bridging has occurred and will have to be broken by drilling or pounding.

Large diameter drilled wells are easy to fill but require a large amount of material. Due to the large volume of these wells, materials cheaper than cement grout and bentonite chips may be used, with approval of the Alabama Department of Environmental Management. The next most suitable material would be soil material at least as fine in texture as the surrounding soil. Regardless of the filler used, at least the top five feet must be filled with bentonite chips, concrete or cement grout to create a solid closure.

For special wells that do not fit into the categories mentioned above, contact a licensed well driller or pump installer for advice. They will have the equipment and expertise to take care of any problems you have.

Your local SCS, county Extension, or department of public health offices may provide special information or assistance in contacting a well contractor. You may also contact the Water Supply Branch, Water

Division, of the Alabama Department of Environmental Management in Montgomery for information at 334/271-7773.

Alabama does not have a code dealing with well abandonment, but some states do, and Alabama could in the near future. It is still a good idea to properly fill and seal unused and abandoned wells on your property. They could lead to contamination of your own water supply. They can also be a legal liability in resale of land or if a groundwater contamination problem is traced to a well on your property, you may be held legally liable for the damages

Summary

Most groundwater in Alabama is free of direct contamination from surface activities, but improperly abandoned wells is one of the most common routes for surface water contamination to get into groundwater. It's important for everyone who uses groundwater to have their water tested annually to make sure the water supply is safe and healthy to drink. Abandoning wells properly eliminates one possible source of contamination.

The seven steps to well abandonment are:
1. Determine type of well,
2. Check on cost-share assistance,
3. Determine well dimensions,
4. Remove debris and piping,
5. Check for contaminants,
6. Select and stockpile appropriate fill and seal materials, and
7. Fill and seal the well.

References

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