

**NATURAL RESOURCES CONSERVATION SERVICE**

**CONSERVATION PRACTICE STANDARD**

**WELL DECOMMISSIONING**

(No.)

**CODE 351**

**DEFINITION**

The sealing and permanent closure of a water well no longer in use.

**PURPOSE**

- Prevent entry of animals, debris, or other foreign substances into well or well bore hole.
- Eliminate the physical hazard of an open hole to people, animals, and farm machinery.
- Prevent entry of contaminated surface water into well and migration of contaminants into unsaturated (vadose) zone or saturated zone.
- Prevent commingling of chemically or physically different ground waters between separate water bearing zones.
- Eliminate possibility of well being used for any other purpose.
- Conserve yield and hydrostatic head of aquifers.
- Restore, as far as feasible, hydrogeologic conditions that existed before well was constructed.

**CONDITIONS WHERE PRACTICE APPLIES**

This practice applies to any drilled, dug, driven, bored, or otherwise constructed vertical water well determined to have no further beneficial use.

This practice does not apply to water wells that were used for waste disposal.

**GENERAL CRITERIA APPLICABLE TO ALL PURPOSES**

Criteria for all purposes will conform to decommissioning procedures presented in ASTM D5299, Standard Guide for Decommissioning of Ground Water Wells, Vadose Zone Monitoring Devices, Boreholes, and Other Devices for Environmental Activities.

Disinfection will conform to procedures explained in *Ground Water and Wells* (Driscoll, 1986, pp. 620-623).

Closure options will be compatible with the rules of the Tennessee Department of Environment and Conservation, Division of Water Supply, Chapter 1200-4-9, Water Well Licensing Regulations and Well Construction Standards. Only licensed individuals may decommission wells in the state of Tennessee.

**Data collection.** As-built construction documents, maintenance records, and other available data for the abandoned water well will be collected, reviewed, and applied toward the development of a well decommissioning plan. Existing conditions will be documented as defined in Plans and Specifications.

**Well preparation.** The well will be cleared of all pumping equipment, valves, pipelines, casings, liners, screens, grease, oil, scum, debris, and other foreign material as explained in ASTM D5299, part 7.3.8.

**Disinfection.** Before sealing, the entire column of well water will be brought to an available chlorine concentration of 50 ppm or greater or other solution specified by local or state requirements. After being agitated in the well water, the chemical solution will be left for no less than 24 hours to assure complete disinfection.

**Sealing materials.** Sealing materials will consist of Portland Class A cement or a quick-setting cement in a ratio of not over 6 gallons of water per 94-pound sack of cement or a high solids bentonite grout with a minimum of 20 percent solids and a weight of no less than 9.2 pounds per gallon measured by a standard mud balance. The use of bentonite in chip or tablet form ranging in size from 1/4" to 3/4" will be allowed as an alternate seal to slurry grouting. Only bentonite grout, tablets, or chips approved by the National Sanitation Foundation (NSF) or American National Standards Institute (ANSI) certified parties as meeting NSF product standard 60 or 61 will be used.

Water to be mixed with grout will be compatible with the grouting material and of a quality that conforms to criteria provided in ASTM D5299, part 7.3.3.

**Fill material.** Fill material will be clean sand and/or gravel 1/2" diameter or less and free of organic or other foreign matter. The gradation will be such that bridging will not occur during placement.

**Placement of material.** Sealing material will be placed into the well only after the well water has been disinfected. Sealing material will be used to fill the entire depth of the well. All sealing material will be placed from the bottom of the well upward by methods that avoid segregation, dilution, or bridging of the material.

Wells extending into more than one aquifer will be filled and sealed in such a way that the exchange of water from one aquifer to another is prevented.

#### **Control of elevated formation pressure.**

The sealing of flowing wells will be accomplished only after the wells have been treated to reduce the flow to zero. This may be accomplished by introducing high specific gravity fluids which are approved for use in potable water systems into the bottom of the well bore and continuing until the flow ceases. Procedures for balancing formation pressures during grouting operations will conform to ASTM D5299, part 7.3.7.

### **CASED WELLS**

**Removal of well casing.** If possible, the casing will be completely removed from the well by either pulling or over-drilling (over-reaming) as explained in ASTM D5299, part 7.3.1. Casing that cannot be removed completely will be ripped, perforated, or cut off at a depth greater than the maximum potential for frost penetration or any other near surface soil fracturing hazard (such as desiccation) or 3 feet, whichever is greater.

**Casings grouted in place.** Casings to be grouted in place will employ a pressurized grouting procedure that will completely fill and seal the open space around the casing.

Perforated or ripped casing will provide sufficient apportioned open area to assure passage of the grout into the space. The casing will be perforated or ripped throughout the entire length of a confining layer.

Casings to be removed from a collapsing formation will be grouted concurrently with removal such that the bottom of the casing remains submerged in the grout.

**Surface seal.** The interval between the ground surface and the top of cut-off casing shall be sealed.

The interval between the ground surface and the top of the cut-off casing shall be filled with soil material that achieves an in-place, hydraulic conductivity equivalent to or less than the surface soil surrounding the well. The ground surface at the sealed well site shall be mounded and graded in a manner that prevents ponding of surface runoff.

### **UNCASED WELLS**

Uncased wells will be decommissioned as for cased wells with the exception of removing or perforating the casing.

### **HAND DUG WELLS**

Hand dug wells greater than 12" in diameter and less than 60' deep may be decommissioned by landowner or the following individuals licensed in Tennessee: licensed engineers, licensed professional geologists, licensed building contractors, licensed pump installers, county environmentalists, or environmental specialists for the state of Tennessee.

Sealing materials will be placed in the well from five to two feet below the land surface. The remaining depth of the well will be filled with a minimum 1' thick layer of sealing materials every 10' and the remainder filled with native soil material or clean gravel less than 1" in diameter. The entire annular space from 2' below the surface to the bottom of the well may be filled with sealing materials, if desired.

### **CONSIDERATIONS**

This practice may be part of a ground water protection system that includes water and chemical management practices.

To the extent practicable, an abandoned well should be decommissioned in a manner that restores the original hydrogeologic conditions of the well site and does not preclude the use of the site from future land management practices.

All decommissioning procedures and fill and sealing materials need to be selected with due consideration of the site-specific geological, biological, physical and climatic conditions; the chemical composition of the surrounding soil, rock, and ground water at the well site; and the well's construction practices.

If allowed by state regulations, fill materials, such as sand, pea gravel, sand-gravel mix, crushed stone, or agricultural lime can be used to plug the well provided that zones of sealing material conform to those defined in this standard.

## PLANS AND SPECIFICATIONS

Plans and specifications for decommissioning abandoned water wells will be consistent with this standard and will describe the requirements for applying the practice to achieve its intended purposes. A record of the installation of this practice will be made and will include the following information:

- Location of the decommissioned well by latitude/longitude, township/range, or other georeference convention, of such precision that it can be readily located in the field, if required, in the future.
- Date of completion of well decommissioning.
- Name of landowner.
- Name, title, and address of person responsible for well decommissioning.
- Total depth of well.
- Length of casing.
- Length of casing removed or length of casing cut off below ground level.
- Inside diameter of well bore or casing.
- Type of casing material or schedule (e.g., standard weight steel or PVC sch-80).
- Static water level measured from ground surface prior to decommissioning.
- Types of materials used for filling and sealing, quantities used, depth intervals for emplacement of each type, and emplacement method used.

## OPERATION AND MAINTENANCE

The practice site will be inspected periodically to ensure that the decommissioned well and the adjacent area have not settled or eroded or are otherwise adversely disturbed. The well site and adjacent ground surfaces will be maintained in a manner that prevents ponding of surface runoff on the site.

## REFERENCES:

American Society for Testing and Materials, Philadelphia, PA. ASTM D5299 Standard Guide for Decommissioning of Ground Water Wells, Vadose Zone Monitoring Devices, Boreholes, and Other Devices for Environmental Activities.

Driscoll, F.G. 1989. *Groundwater and Wells*. Johnson Filtration Systems, St. Paul, MN.

Tennessee Department of Environment and Conservation. Chapter 1200-4-9, Water Well Licensing Regulations and Well Construction Standards. Nashville, TN.