

**NATURAL RESOURCES CONSERVATION SERVICE  
CONSERVATION PRACTICE STANDARD**

**WELL DECOMMISSIONING**

(No.)

CODE 351

**DEFINITION**

The sealing and permanent closure of an inactive, abandoned, or unusable water or monitoring well.

**PURPOSE**

A well is decommissioned to achieve one or more of the following purposes:

- Remove a water or monitoring well from active use when it is no longer needed, it cannot be rehabilitated, or it has failed structurally.
- Remove a monitoring well from use when it is no longer capable of providing representative samples or it is providing unreliable samples.
- Eliminate a physical hazard to people, animals, and farm machinery and prevent entry of animals, debris, or other foreign substances.
- Prevent contamination of groundwater by surface water inflow.
- Restore the natural hydrogeologic conditions, to the extent possible, by preventing vertical or lateral cross-contamination or commingling of groundwaters between separate water-bearing zones.
- Eliminate the possibility of repurposing the well.
- Allow for future alternative use or management of the site

**CONDITIONS WHERE PRACTICE APPLIES**

This practice applies to any water well or monitoring well selected for decommissioning.

**CRITERIA**

**General Criteria Applicable to All Purposes**

Closure options shall be compatible with all applicable federal, state, and local requirements.

**Data collection.** As-built construction documents, maintenance records and other available data for the abandoned water well shall be collected, reviewed and applied toward the development of a well decommissioning plan. This includes length and diameter of the casing, total well depth, depth to water table, type of liners and screens, and related information. Available driller's records are located in files at the Hydrogeology Division of the Geological Survey of Alabama in Tuscaloosa at 205-349-2852. The existing conditions of the well shall be documented as shown in the "**Plans and Specifications**" section. Data shall be recorded on NRCS Form AL-ENG-45 or AL-ENG-45a.

**Well preparation.** Clear the well of all pumping equipment, valves, pipelines, grease, oil, scum, debris, and other foreign material. To the extent practicable, remove all casings, liners, and screens. Remove casing by either pulling or overdrilling (over-reaming) in accordance with guidance in

ASTM D5299, "Standard Guide for Decommissioning of Groundwater Wells, Vadose Zone Monitoring Devices, Boreholes, and Other Devices for Environmental Activities."

If some or all of the casing resists removal by pulling or overdrilling, it must be ripped, perforated, or cut off below the ground surface. For the cut-off depth, use the greater of two feet, the maximum potential depth for frost penetration, or the depth of any other near-surface soil fracturing process (such as desiccation).

**Disinfection.** Before sealing, the entire column of well water shall 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 shall be left for no less than 24 hours to assure complete disinfection.

**Sealing materials.** Sealing materials must conform to the characteristics listed in ASTM D5299. Sealing materials do not require disinfection. Select sealing materials that have an in-place hydraulic conductivity equivalent to or less than the ground surface soil surrounding the well head.

The quality of the water used for mixing with sealing materials must meet or exceed criteria provided in ASTM D5299.

Where the geologic hydraulic conductivity is unknown, sealing material should have a maximum allowable hydraulic conductivity of  $10^{-6}$  cm/sec.

**Fill material.** Fill materials can be used in lieu of sealing materials under certain conditions to reduce cost. The use of fill materials to plug a drilled well should be used only after careful examination of the drilling logs. Assistance from a trained geologist may be necessary.

Fill materials can include sand, pea gravel, sand-gravel mix, crushed stone, and agricultural lime, all of which shall be clean and free of organic or other foreign matter. Clay subsoil can be used in certain situations.

The gradation of fill materials shall be such that bridging does not occur during placement. To protect against bridging during placement, the maximum particle size of the fill materials should not exceed 1/10 of the well diameter. Materials greater than 3 inches should not be used regardless of the well diameter.

**Plugging and sealing procedures.** Do not place sealing and fill materials until after completion of the disinfection process, if conducted.

The first layer of fill material will be placed in the bottom of the well and will extend upward to a point that is no less than one foot above the top of the lowest water-bearing zone.

Place sealing material in a layer no less than one-foot thick above the top of the first layer of fill material. Sealing materials are used to restrict vertical movement of water and to prevent comingling of waters from different production zones. Install an alternating sequence of one-foot of sealing material and a maximum of 10 feet of fill material throughout the remaining well column. If another water-bearing zone is encountered, adjust the spacing of the fill layers so that the zone is sealed. Fill the borehole to a point that is two feet from the ground surface or to the top of the cutoff casing, whichever is greater. The last layer must be a sealing layer.

Use installation methods that avoid segregation, dilution, or bridging of the fill or sealing material.

For wells greater than 30 inches in diameter, place and compact backfill in a

manner that minimizes segregation and bulking and prevents surface subsidence.

**Removal of well casing.** If possible, the casing shall be completely removed from the well by either pulling or overdrilling (overreaming) as explained in ASTM D5299. Casing that cannot be removed completely shall 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 three feet, whichever is greater.

**Casings grouted in place.** Use a pressurized grouting procedure that will completely fill and seal all open spaces in the annulus. Acceptable grout sealant includes a combination of cement, sand, or bentonite that conforms to guidance provided in ASTM D5299.

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

If casings are within a collapsing formation, conduct the grouting procedures concurrently with removal of the casing so that the bottom of the casing remains submerged in the grout.

**Well-head seal.** Seal the interval between the ground surface and the top of the cut-off casing or last sealed layer with materials that conform to guidance in ASTM D5299. These materials may be an extension of the sealing materials used below this depth.

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.

Annular space around the outside of the well casing below the cutoff depth shall be grouted as needed. Wells with gravel exposed in the annular space at cutoff depth shall have at least a 3-foot depth of the gravel removed and the annular space backfilled with grout, bentonite chips or other expansive sealer.

**Control of artesian pressure.** If a well is under artesian pressure (flowing or not flowing), maintain a sufficiently high grout pressure to counteract the artesian pressure until initial grout set occurs. Use procedures for balancing pressures during grouting operations given in ASTM D5299.

**Vegetation.** All areas which are disturbed during the decommissioning operation shall be smoothed and dressed at the completion of sealing the well. These areas shall be established with vegetation in accordance with the FOTG Standard for Critical Area Planting (342), unless the area is to be utilized for crop production.

## CONSIDERATIONS

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

If allowed by State regulations, fill materials, such as sand, pea gravel, sand-gravel mix, crushed rock, or agricultural lime, can be used to fill the well provided that the zones of sealing material conform to requirements in ASTM D5299.

If feasible, consider adding a metal “target” to the top 3 inches of the well-head seal so that the decommissioned well may be easily located with a metal detector.

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. For additional information on local conditions, discuss site conditions with drilling and well servicing contractors. Special equipment may be required; therefore, it is advisable that a qualified contractor perform the work.

In some Karst terrains, where large voids may exist, it may be difficult to plug a well. Another consideration is that large quantities of sealing materials may cut off an underground stream or otherwise alter the hydrogeology.

Checking for contaminants is recommended. Waste oil, pesticides, and garbage are among some of the more common contaminants found in wells. Groundwater remediation (not covered in this standard) may be required. Pumping and removal of contaminants may prevent future widespread groundwater contamination problems. The Alabama Health Department or Alabama Department of Environmental Management should be contacted for guidance on remediation and sealing of contaminated wells.

## PLANS AND SPECIFICATIONS

Prepare plans and specifications for decommissioning a well that describe the requirements for applying the practice to achieve its intended purposes. Make a record of the installation of this practice that includes the following:

- Location of the decommissioned well by Global Positioning System (GPS), latitude/longitude, township/range, or other georeferencing convention, of such precision that allows the ready location of the site
- 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 prior to decommissioning
- Length of casing removed or length of casing cut off below ground level
- Lengths of casing ripped or perforated and the method used
- Inside diameter of well bore or casing
- Type or schedule of casing material (e.g., standard weight steel, or PVC Sch-80)
- Static water level measured from ground surface prior to decommissioning
- Photographs before and after decommissioning
- Types of materials used for filling and sealing, quantities used, depth intervals for installation of each type of material, and the placement method used
- Detailed documentation of all other information pertinent to site conditions and other problems encountered during decommissioning.

## OPERATION AND MAINTENANCE

**INSPECT THE PRACTICE SITE PERIODICALLY TO ENSURE THERE IS NO GROUND SETTLEMENT, EROSION, OR OTHER DISTURBANCE. MAINTAIN THE SITE IN A MANNER THAT PREVENTS PONDING OR SURFACE RUNOFF TOWARD THE SITE**

## REFERENCES

American Society for Testing and Materials, D5299, "Standard Guide for Decommissioning of Groundwater Wells, Vadose Zone Monitoring Devices, Boreholes, and Other Devices for Environmental Activities." ASTM International. 100 Barr Harbour Dr., P.O. Box C-700, West Conshohocken, PA.

AWWA Standard for Water Wells - AWWA A100-97

ADEM Administrative Code 335-7-5-14

EPA-57019-75-001 Manual of Water Well Construction Practices

ADEM - Water Well Standards Program, Code R. 335-9-1-.06(g)