

NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD
WATER WELL DECOMMISSIONING

(No.)

CODE 351

DEFINITION

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

PURPOSE

- To eliminate physical hazard to people, animals, and farm machinery and to prevent entry of animals, debris, or other foreign substances.
- To prevent contamination of groundwater by surface water inflow.
- To restore the natural hydrogeologic conditions, to the extent possible, by preventing vertical cross-contamination or commingling of groundwaters between separate water-bearing zones.
- To eliminate the possibility of the water well being used for any other purpose.
- To allow future alternative use or management of the site.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies to any vertical water well that is to be decommissioned.

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

CRITERIA

Criteria for all purposes shall conform to decommissioning procedures presented in American Society for Testing and Materials (ASTM) D 5299.

All work shall comply with [Kansas Administrative Regulations \(K.A.R.\) 28-30-7, "Plugging of abandoned wells, cased and uncased test](#)

[holes](#)," that is administered by the Kansas Department of Health and Environment (KDHE).

Decommissioning shall be compatible with all applicable federal, tribal, state, and local requirements. Laws, rules, and regulations of particular concern include those involving water rights, land use, pollution control, property easements, wetlands, preservation of cultural resources, and endangered species.

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 data shall include the depth and diameter of the well and the depth to the static water level. Existing conditions shall be documented as defined in the Plans and Specifications section.

Well preparation. The well shall be cleared of all pumping equipment, valves, pipelines, casings, liners, screens, grease, oil, scum, debris, and other foreign material as explained in ASTM D 5299, part 7.3.8.

Disinfection. Before sealing, the entire column of well water shall be treated with sufficient chlorine to produce at least a 100 parts per million (ppm) concentration within the well bore. After being agitated in the well water, the chemical solution shall be left for no less than 24 hours to ensure complete disinfection.

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

Plugging the well. The well shall be plugged by using suitable fill materials with layers of sealing material emplaced to restrict movement of water vertically in the well.

Sealing materials. Properties of sealing materials shall conform to characteristics listed in ASTM D 5299, part 6.3. Acceptable sealing materials are provided in ASTM D 5299, part 6.4. Sealing materials do not require disinfection. Water to be mixed with sealing materials shall be of a quality that conforms to criteria provided in ASTM D 5299, part 7.3.3.

Fill material. Fill material shall be clean and free of organic or other foreign matter. The gradation shall be such that bridging will not occur during placement. Coarse sand or fine gravel may be used as fill material to plug the well, provided that the well is cased and completed in a single unconfined aquifer.

Plugging procedures. Sealing and fill material shall be placed into the well only after the well water has been disinfected.

Fill material shall be placed from the bottom of the well to the static water level or 6 feet below ground level--whichever is the greatest distance below ground level.

Sealing material shall be placed from the bottom of the well or the top of the fill material (if used).

All material shall be placed from the bottom of the well upward by methods that avoid segregation, dilution, or bridging of the material.

For wells greater than 30 inches in diameter, backfill shall be placed and compacted in a manner that minimizes segregation and bulking to prevent 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 D 5299, part 7.3.1. 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 3 feet--whichever is greater.

Casings grouted in place. Casings that are cut off shall meet the grouting requirements as specified in [K.A.R. 28-30-203](#). Casings to be grouted in place shall employ a pressurized grouting procedure that will completely fill and seal the open space around the casing.

Perforated or ripped casing shall provide sufficient apportioned open area to ensure passage of the grout into the space. The casing

shall be perforated or ripped throughout the entire length of a confining layer.

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

Well-head seal. The interval between the ground surface and the top of the cutoff casing shall be sealed with sealing materials that conform to ASTM D 5299, part 6.3. 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 cutoff 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.

Control of artesian pressure. If a well penetrates a formation that is under artesian head (confined conditions) or from which a gas is being released under pressure, the grout pressure must be maintained greater than the formation pressure until initial grout set occurs. Procedures for balancing formation pressures during grouting operations shall conform to ASTM D 5299, part 7.3.7.

Record of plugging the well. A record must be filed with the KDHE office in Topeka, Kansas, within 30 days following the completion of the above plugging procedures. In accordance with [Kansas Statutes Annotated \(K.S.A.\) 82a-1212, Form WWC-5P, Water Well Plugging Record](#), is to be used to record this information.

DEFINITION OF TERMS

Aquifer. An underground formation that contains and is capable of transmitting groundwater.

Unconfined aquifer. An aquifer containing groundwater at atmospheric pressure—the upper surface of the groundwater in an unconfined aquifer is the water table.

Confined aquifer. An aquifer which is overlain and underlain by impermeable materials—groundwater in a confined aquifer is under pressure greater than atmospheric pressure and will rise in a well above the level at which it is first encountered. This may also be called an artesian aquifer.

Static water level. The highest point above or below ground level which the groundwater in the well reaches naturally.

Cement grout. A mixture consisting of one 94-pound bag of Portland cement, an equal volume of sand (the diameter of the particles shall be no larger than 0.08 inch), and 5 to 6 gallons of clean water.

Bentonite grout. A mixture consisting of water and sodium bentonite clay containing high solids—the mixture shall be in accordance with the manufacturer's recommendations to achieve a weight of not less than 9.4 pounds per gallon of mix. Sodium bentonite pellets, tablets, or granules may be used provided that, when hydrated, they create a permanent and impervious material as specified in [K.A.R. 28-30-2](#).

CONSIDERATIONS

This practice may be part of a groundwater 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 groundwater 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 if zones of sealing material conform to ASTM D 5299, part 6.3. These materials will meet KDHE regulations provided they are washed and disinfected prior to placement in a well and have a maximum grain size of 1 inch in diameter.

Consider the proximity of abandoned water wells to other planned and existing water wells.

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

The effects of this practice on air and plant resources should be minimal.

PLANS AND SPECIFICATIONS

Plans and specifications for decommissioning abandoned water wells shall be consistent with this standard and shall describe the requirements for applying the practice to achieve its intended purposes. A record of the installation of this practice shall be made and shall 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.
- Length of casing ripped or perforated and method used.
- Inside diameter of well bore or casing.
- Type of casing material or schedule (for example, standard weight steel or polyvinyl chloride [PVC] Schedule 80).
- Static water level measured from the ground surface prior to decommissioning.
- Photographs before and after decommissioning.
- Types of materials used for filling and sealing, quantities used, depth intervals for emplacement of each type, and emplacement method used.

- All other pertinent information based on site conditions and any other problems encountered during decommissioning should be documented in detail.

An artesian well to be decommissioned (whether flowing or not) shall be treated as an abandoned well in a confined aquifer.

Construction and material specifications shall be developed that conform to [Article 30, Water Well Construction and Abandonment](#), KDHE.

Type I Portland cement shall normally be used when using cement grout as a plugging material;

however, Type II cement shall be used in the presence of high sulfate conditions.

OPERATION AND MAINTENANCE

The practice site shall 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 shall be maintained in a manner that prevents ponding of surface runoff on the site.