

**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

- Eliminate the physical hazard to people, animals, and farm machinery; and to 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 cross-contamination or commingling of groundwaters between separate water bearing zones
- Eliminate possibility of well being used for any other purpose
- 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 ASTM D5299, Standard Guide for Decommissioning of Ground Water Wells, Vadose Zone Monitoring Devices, Boreholes, and Other Devices for Environmental Activities.

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

Decommissioning shall be compatible with all applicable Federal, State, Tribal, and local requirements.

Colorado statutes govern the use of underground water. The "Rules and Regulations for Water Well Construction, Pump Installation, and Monitoring and Observation Hole/Well Construction" as set forth by the State of Colorado - State Board of Examiners of Water Well Construction and Pump Installation Contractors shall be followed. (See References) These regulations contain specific requirements for plugging wells and test holes.

Data collection. As-built construction documents, maintenance records and other available data for the water well to be decommissioned shall be collected, reviewed and included in a well decommissioning plan. Existing conditions shall be documented as defined in Plans and Specifications.

Well preparation. The well shall be cleared of all pumping equipment, valves, pipelines, grease, oil, scum, debris, and other foreign material as explained in ASTM D5299, part 7.3.8. Casings, liners, and screens shall also be removed, unless impracticable.

Disinfection. Water wells shall be disinfected as an integral part of the decommissioning process. Before sealing, the entire column of well water shall be brought to an available chlorine concentration of 100 ppm or greater or other higher chlorine concentration solution as specified by local, State, Tribal or Federal requirements. After being agitated in the well water, the solution shall remain for no less than 24 hours to assure complete disinfection.

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. Sealing materials used in water well decommissioning shall be of sufficiently low hydraulic conductivity to prevent groundwater flow vertically in the well. Properties of sealing materials shall conform to characteristics listed in ASTM D5299, part 6.3. Acceptable sealing materials are provided in ASTM D5299, part 6.4 to 6.6. Sealing materials do not require disinfection.

Water to be mixed with sealing materials of a quality that conforms to criteria provided in ASTM D5299, part 7.3.3.

Fill material. Fill material shall be clean and free of organic or other foreign matter. The fill material will be graded so that bridging will not occur during placement.

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

Place fill material from the bottom of the well to the top of the lowest water-bearing.

Sealing material is placed at a minimum thickness of one foot starting at the top of the lowest water bearing zone and successively placed at intervals every 10 feet or less throughout the remaining well column.

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 D5299, part 7.3.1. and 7.3.8. 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. Casings to be grouted in place shall employ a pressurized grouting procedure that will completely fill and seal any open space around the casing. Grout may consist of cement, sand, bentonite, an approved combination of these constituents, or other approved sealing materials.

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 cut off casing shall be sealed with sealing materials that conform to ASTM D5299, part 6.3. These materials may be an extension of the sealing materials used below this depth.

The soil or sealing material shall achieve 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 is under artesian head (flowing or not flowing), the grout pressure must be maintained to counteract the artesian pressure until initial grout set occurs. Procedures for balancing pressures during grouting operations shall conform to ASTM D5299, part 7.3.7.

Flowing wells present special problems for sealing. Grout and cement materials introduced into the bottom of the well must be heavy enough to overcome the hydraulic pressure of the aquifer without becoming diluted or segregated. Only a licensed well driller with experience in sealing flowing wells shall be contracted to do this work.

CONSIDERATIONS

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 ASTM D5299, part 6.3.

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.

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PLANS AND SPECIFICATIONS

Plans and specifications for decommissioning a 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 Global Positioning System latitude/longitude, township/range, or other georeference convention, of such precision that it can be readily re-located
- 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
- Lengths of casing ripped or perforated and method used
- 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

- 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

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.

REFERENCES

State of Colorado - Rules and Regulations for Water Well Construction, Pump Installation, and Monitoring and Observation Hole/Well Construction (Water Well Construction Rules) 2 CCR 402-2 can be located at the following web address: <http://water.state.co.us/groundwater/boe/pages/boerules.aspx>

Driscoll, Fletcher G., 1986, Ground Water and Wells; published by Reynolds Guyar Designs