Private Water Well Construction Requirements and Private Water Well Testing

North Dakota Board of
Water Well Contractors
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with

NORTH DAKOTA
DEPARTMENT of HEALTH

Private Water Wells

Throughout North Dakota, private water wells provide a safe and dependable ground water supply for domestic, livestock, irrigation and industrial needs. Recognizing that water wells are a matter of public health and safety, the 1971 state legislature established the State Board of Water Well Contractors. The board's responsibilities include (1) maintaining a certification program for water well contractors and water well pump and pitless unit installers; and (2) enforcing rules that set standards for water well construction and pump and pitless unit installation. Anyone hired to construct or repair a well, or install or repair a pump or pitless unit, must be certified by the board. However, individuals may install or repair wells on their property provided the water well rule requirements are met.

Water Well Location

The water well rules set minimum lateral distances from private wells to the following potential contamination sources:

- At least 50 feet from septic tanks, absorption fields, privy pits, barnyards, feedlots and high-water marks of lakes, streams, sloughs, ponds.
- At least 30 feet from sewer lines.
- At least 2 feet from eaves of buildings, 10 feet from basements or pits and 20 feet from overhead power lines.

Greater distances from potential contaminant sources may be necessary, depending on soil conditions. Well owners should be mindful of other potential contamination sources that may threaten well water quality, such as waste disposal sites, fuel storage tanks, fertilizer or pesticide storage or mixing areas, and improperly constructed wells. Wells

should not be located in basements, pits or any other space below ground surface. Wells located below ground may present a safety hazard to the owner and be subject to flooding.

Water Well Construction

Most water wells are constructed by the rotary drilling method where the borehole is drilled by a rotating bit as the formation cuttings are brought to the surface by continuous circulation of drilling fluid. After reaching the desired depth, a plastic or steel well casing is set in the borehole. The lower part of the casing is slotted to form a well screen that allows ground water to enter the well but restricts the entry of formation sediment. The casing above the well screen must be water-tight and extend at least 12 inches above ground and be covered with a properly fitting cap.

The annular space between the borehole and casing is a potential pathway for surface contaminants. Grouting the annular space prevents surface water from draining downward around the outside of the well casing and contaminating the well and the aquifer, as illustrated in Figure 1. Neat cement, at a ratio of 94 pounds of cement (one sack) to 6 gallons of water, is the most commonly used grouting material. The grout must be added from the bottom of the annular space upward in one continuous operation until the annular space is filled. The annular space must be large enough to allow the placement of at least 1 1/2 inches of grout around the well casing. Grout must extend a minimum of 30 feet from the ground surface or from the bottom of the pitless unit when one is used. Grouting requirements for wells less than 30 feet deep are dependent upon the depth of the well screen and the static

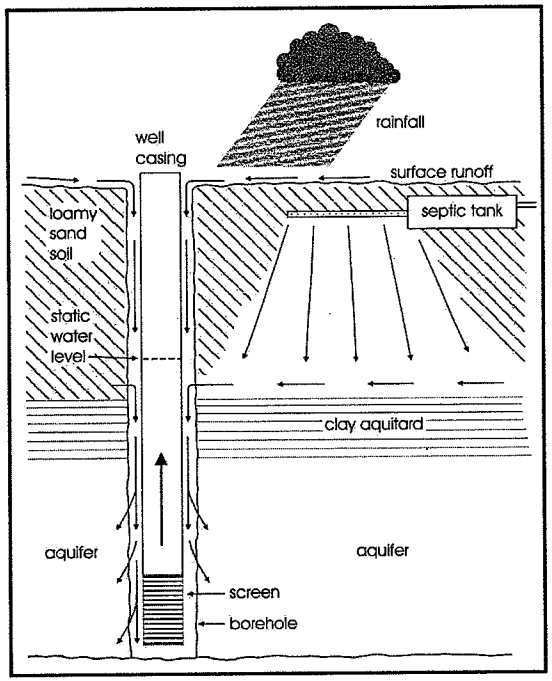

Figure 1. Potential contamination of well and aquifer caused by ungrouted well

water level. Figure 2 illustrates a properly constructed water well with a submersible pump and pitless unit.

When a new well is completed, the owner should receive a copy of the well log that the well driller must submit to the board. Well owners should keep the log for future reference because it provides details such as date of well construction, geologic formations encountered, casing diameter, screened interval depth and static water level.

A driven-point well is an alternative type of shallow well constructed by driving lengths of small-diameter pipe into the ground. A screened drive point, sometimes called a sand point, is threaded to

the first length of pipe, and successive lengths of threaded pipe are added as it is driven into the ground. Driven-point wells are generally completed at depths of less than 30 feet. They cannot penetrate rocks or hard, cohesive soils, so they are generally limited to use in areas of sandy soil with a shallow water table. Placement of a driven-point well must comply with the water well location requirements. The location should be chosen carefully because shallow wells completed in sandy soil are vulnerable to contamination. Installation of driven-point wells is restricted to individuals installing a water well on their property solely for their use.

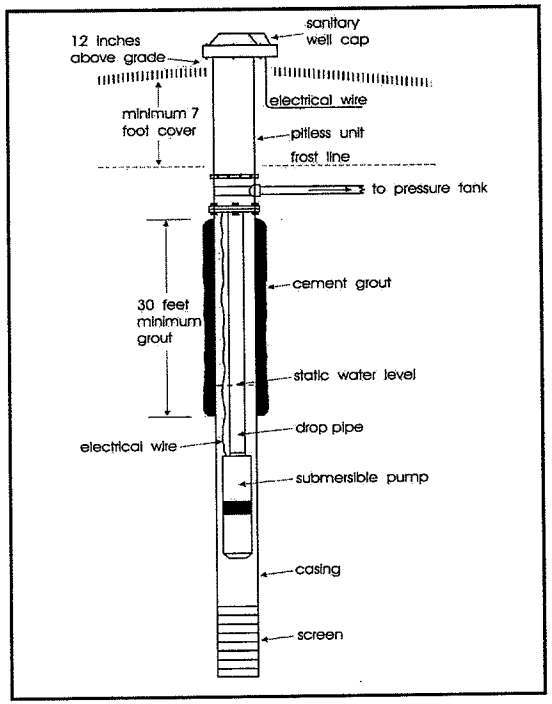

Figure 2. Approved well construction showing submersible pump and pitless unit

Because of the short screen length and small diameter casing, the yield from driven-point wells is limited. Most driven-point wells are used for lawn and garden watering, and they typically are not recommended to supply drinking water.

Water Well Testing

Testing a water sample from a new or existing well will confirm the safety and quality of the water. Many types of water quality tests are available, but tests for bacteria, nitrate and mineral content are the most widely used. The first step is to contact one of the laboratories listed on page 8 of this brochure.

Human and animal wastes are the main sources of bacteria in water and can contaminate wells through runoff from feedlots and pastures, seepage or discharge from septic systems, and inundation or infiltration of flood waters. Poorly constructed wells, such as those that do not have watertight casings or are not properly grouted, are especially vulnerable to bacterial contamination.

Bacteriological testing uses total coliform bacteria as an indicator of contamination. Although coliform bacteria are widespread, most do not cause disease. If the water tests positive for total coliform bacteria, however, it indicates that potentially disease-causing fecal coliform bacteria, such as *E. coli*, may be present.

The well and household distribution system should be disinfected with a chlorine solution of 100 milligrams per liter (mg/l) if the well tests positive for total coliform. The water should not be consumed, unless brought to a boil for 1 minute, until retesting confirms that it is safe.

Materials used in the construction or repair of a well are contaminated with dirt and bacteria. The

water well contractor should therefore disinfect the well and distribution system after a new well is constructed or an existing well/pump is repaired or replaced, and advise the well owner to conduct a bacteriological test.

Elevated levels of nitrate in well water may originate from nearby feedlots, septic systems and fertilized cropland. Shallow or poorly constructed wells are especially vulnerable to nitrate contamination. Consuming nitrate-contaminated water may cause "blue baby syndrome" in infants younger than 6 months. Water with levels higher than 10 mg/l of nitrate as nitrogen (or 45 mg/l nitrate) should not be given to infants younger than 6 months, nor should it be used to prepare infant formula.

Mineralogical testing identifies the dissolved minerals in water. Dissolved minerals may affect the usefulness of water for various purposes. Some type of treatment may be necessary to improve water quality for a given use. The North Dakota State University Extension Service has several publications about water treatment, including well disinfection, available on its website at www.ag.ndsu.edu/extension.

The presence of arsenic in ground water may be a specific concern to private water well users. Arsenic is a naturally occurring element in rock and soil. Although residues of past arsenic pesticide use or improper disposal may occur in places, almost all arsenic in ground water is from naturally occurring sources. Adverse health effects from exposure to arsenic in drinking water typically take years to develop, and it is difficult to determine what levels may lead to a particular health problem. The maximum contaminant level (MCL) of arsenic in a public water system (PWS) is 10 micrograms per

liter, but the level is not regulated in private water wells. Private water well users may wish to use the MCL for arsenic in a PWS as a guide to assessing the health risks from their well water. Contact one of the mineralogical testing laboratories listed in this brochure to arrange for an arsenic analysis.

Abandoned Water Wells

Abandoned wells pose a risk to ground water quality because the well casing is a conduit from the land surface to the aquifer where the well is screened. A damaged well casing or cap may allow surface pollutants to enter the well and contaminate ground water.

Abandoned water wells also pose other risks, including cross contamination of aquifers, reduced yield and hydrostatic head of aquifers, safety hazards to humans and animals, and liability to owners.

Properly plugging abandoned wells will reduce or eliminate risks. Shallow large-diameter wells can be plugged using simple materials and methods outlined in guidelines available from the NDSU Extension Service website. Deep well plugging, however, can be properly achieved only by grouting techniques employed by water well contractors.

For More Information

For questions about wells or water quality, contact a water well contractor. For the water well construction rules or lists of certified water well contractors or certified pump and pitless unit installers, call the Board of Water Well Contractors field representative at 701.328.2754. For private water testing, call the North Dakota Department of Health Division of Water Quality at 701.328.5210 or visit its website at www.ndhealth.gov/wq.

North Dakota Laboratories for Well Water Testing

Bacteriological and Nitrate Testing

Astro-Chem Lab Inc.
4102 2nd Ave W
PO Box 972
Williston, ND 58801
701.572.7355

City of Grand Forks
Environmental Laboratory
503 S 4th St
Grand Forks, ND 58201
701.746.2594

Fargo-Cass Public Health
Environmental Laboratory
435 14th Ave S
Fargo, ND 58103
701.298.6997

First District Health Unit
801 11th Ave SW
PO Box 1268
Minot, ND 58702 -1268
701.852.1376

Minnesota Valley
Testing Laboratories Inc.
1411 S 12th St
Bismarck, ND 58504
701.258.9720 or
800.279.6885

Southwestern District
Health Unit
2869 3rd Ave W
Dickinson, ND 58601
701.483.0171
800-697.3145

Mineralogical Testing

N.D. Department of
Health - Division of
Laboratory Services
2635 E Main Ave
PO Box 937
Bismarck, ND 58502
701.328.6142

Minnesota Valley
Testing Laboratories, Inc.
1411 S 12th St
Bismarck, ND 58504
701.258.9720 or
800.279.6885

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4102 2nd Ave W
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