



Water is Life : Quality Matters



# HOW TO PROTECT YOUR WELL WATER

Fact Sheet 1  
Revised March 2012

## WHY SHOULD I BE CONCERNED?

A source of clean drinking water is critical for human health. Many rural residents obtain their drinking water from a well and thus must take special care to protect their water source from contamination. Locating and controlling sources of pollution to groundwater can be challenging, but is far preferable to the cost and difficulty of cleaning up contaminated groundwater. Ironically, wells are often the most direct route for pollutants to get into our groundwater. Even wells which aren't used as a drinking source need to be protected, because contamination that enters may pollute a neighboring well.

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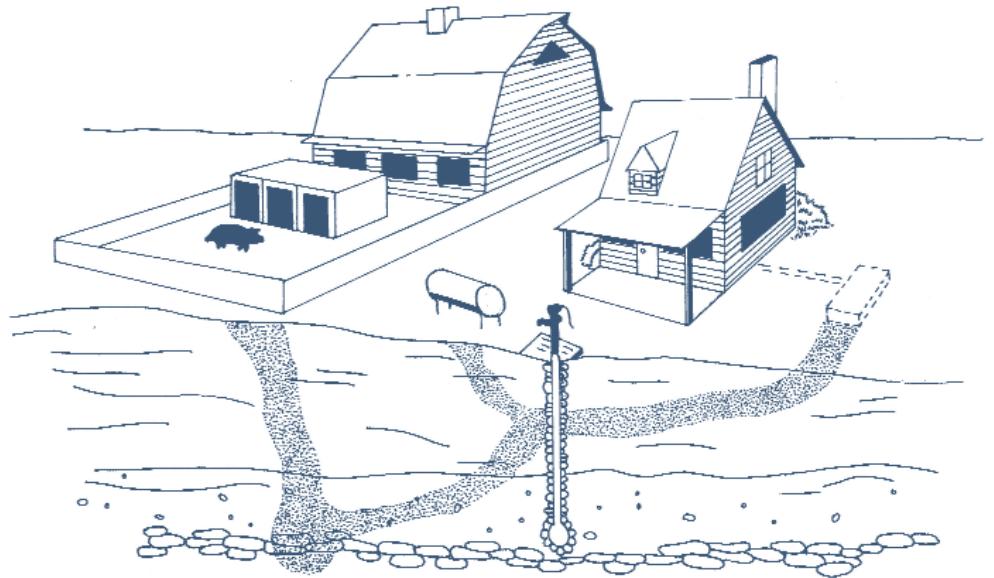
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## WELL LOCATION

Whether a well taps water just below the ground or hundreds of feet deep, its location on top of the ground is a crucial safety factor. A well downhill from a livestock yard, a leaking fuel tank, or a septic system, runs a greater risk of contamination than a well on the uphill side of these pollution sources.

Surface slope does not always indicate the direction a pollutant might flow once it gets into the ground. Shallow groundwater often flows in the same direction as surface water. Water deep below the surface, however, may flow in a different direction than surface water.



## Separation Distances from Pollution Sources

Many states encourage good well location by requiring minimum separation distances from sources of potential pollution, thus using the natural protection provided by soil. Utah law specifies the separation distance of only a few potential contamination sources to private wells. The table below shows separation distances required by Utah law and suggested distances from other potential pollution sources. Keep in mind that these are minimum distances.

### RECOMMENDED SEPARATION DISTANCES BETWEEN A WELL AND POTENTIAL HOMESTEAD SOURCES OF CONTAMINATION

5 feet	nearest dwelling, property lines
10 feet	clear water drain, cistern
15 feet	<i>sanitary or storm sewer</i> , connected foundation drain
25 feet	<i>sewer lines</i> , nearest stream, lake, pond or ditch
50 feet	<i>septic tanks</i> , milk house floor drain, wastewater holding tank
100 feet	<i>septic tank drainfields*</i> , livestock pen or yard, manure pile, silo, sanitary or storm sewer, chemical storage
1500 feet	uncovered salt or salt mixture storage

*Italicized separations required by Utah Administrative Code R317-4-4.3*

*\* 200 feet separation if well is ungrouted*

#### TAKE ACTION!

Provide the most separation possible between your well and any potential contamination source, especially if your homestead is located in an area where the dominant soils are highly permeable or if the contamination source or activity presents a high risk of contamination.

The minimum separation distances apply to new well installation. Existing wells are required by law only to meet separation requirements in effect at the time of well construction. Make every effort, however, to ensure that existing wells exceed “old requirements,” and strive to meet current regulations whenever possible.

Simply separating your well from a contamination source may reduce the chance of pollution, but it does not guarantee that the well will be safe. Stormwater and groundwater can carry bacteria, oil products, and pesticides from one place to another. Wells located in the path of polluted water run a risk of contamination from overland flow washing into the well. This risk is increased for wells that were not constructed and grouted properly, especially in low lying areas.

Some wells pump groundwater that lies beneath a fairly waterproof or impermeable layer, such as clay. The water from these artesian wells is under pressure, and usually flows freely at the surface. These wells are often protected from contamination sources nearby because the confining layer tends to prevent mixing of the deeper groundwater with surface water or groundwater above the layer. Pollutants may enter these wells, however, from sources at the recharge area, which may be a considerable distance away. Artesian wells are more likely, therefore, to be affected by activities outside the homestead.

# Well Casing

## **TAKE ACTION!**

To identify pollution risks to an artesian well, locate the aquifer recharge area and conduct an assessment at that site. For advice, contact the Utah Division of Water Rights in Salt Lake City (801-538-7240) or the Division of Drinking Water (801-536-4200)

## Well Depth and Soil Characteristics

Shallow wells draw from the groundwater nearest the land surface, which may be directly affected by homestead activities. Rain and surface water that soak into the soil may carry pollutants into the well. Local geologic conditions determine how long it takes for this to happen. In areas with thin soil or sands, over fractured bedrock or over sand or gravel aquifers, contaminants may reach groundwater in weeks, days, or even hours. On the other hand, thick clay soils impede contaminants from reaching the water table which may prevent or delay contamination of a well.

If you have a deep well (more than 100 feet below the water table), then the groundwater supplying your well may have traveled a considerable distance underground over a long time, offering greater protection to the well.

## WELL CONSTRUCTION

Wells located in pits, low lying areas, or without proper grouting or a cap can allow contaminated surface water to drain directly into the drinking water supply. Proper well design reduces the risk of pollution by sealing the well from contaminants that might enter it from the surface. The way in which a well is constructed, even if the design is sound, affects its ability to keep out contaminants.

**TAKE ACTION!** Well construction information may be available from the person who drilled your well, the previous owner. The well log would be filed with the Utah Division of Water Rights office located in Salt Lake City (801-538-7240).

The well driller installs a steel or plastic pipe called casing during construction to prevent collapse of the borehole. The space between the casing and the sides of the hole provides a direct channel for polluted surface water or undesirable water from an overlying aquifer to seep down to the well intake. To seal off this channel, the casing is surrounded with grout (cement or a type of clay called bentonite, depending on the geologic materials encountered). A layer of grout at least 1 1/2 inches thick must surround the casing.

The depth of casing required by state standards (UAC R655-4-8.2) depends on the nature of the subsurface geologic materials. In unconsolidated formations (sand and gravel), the casing must extend at least to a depth of 18 feet. For rock wells, casing should extend at least 5 feet into the bedrock formation with a minimum total casing length of 18 feet.

Wells cased to below the water level in the well can provide greater protection from contamination. Well casing extending at least 25 feet below the water level can ensure that surface water is filtered through soil and geologic materials before entering the screen.

Typically, the casing extends above surrounding land, which prevents surface water from running down inside the well. At least 18 inches of casing pipe should extend above the final grade of the land. Additionally, the well casing should extend 3 feet above the greatest flood level of record. Surface water should drain away from the casing.

## **TAKE ACTION!**

You can use a light to visually inspect the condition of your well casing for holes or cracks at the surface, or down the inside of the casing. If you can move the casing around by pushing against it, you may have a problem with your well casing's ability to keep out contaminants. In areas of shallow fractured bedrock (less than 20 feet from the surface), check on the condition of your well casing by listening for water running down into the well when the pump is not running. If you do hear water, there could be a crack or hole in the casing, or your casing does not reach the water level in the well. Either situation is risky.

# Well Type

Dug wells pose the highest risk of allowing drinking water supply contamination because they are likely to be shallow, insufficiently lined, and poorly protected from surface water. A dug well is a large-diameter hole (usually more than 2 feet wide), which often has been constructed by hand. Many are still in use in rural areas.

All other types of wells, including those constructed by a combination of jetting and driving, are drilled wells. Drilled wells for farm use are commonly 4 to 8 inches in diameter and may be hundreds of feet deep.

# Backflow Prevention

Backflow or back siphoning can occur when the water pressure in a hose or hydrant reverses the direction of the flow. This commonly occurs when a hose is submerged in liquid and the flow is shut off, allowing some of the liquid to flow back through the hose to the water source. This can be particularly dangerous when the liquid contains drinking water contaminants. Inexpensive anti-backflow devices or backflow preventors for hoses used to fill farm sprayers are available from irrigation or spray equipment suppliers.

Anti-backflow devices should also be considered on all faucets to which hoses are connected as well as maintaining air gaps between hoses or faucets and the water level. Otherwise, there is a risk of allowing contaminated water to backflow into a well from sinks, washing machines, pressure washers, laundry tubs, and outside hydrants. Water supplies that have cross-connections between them (connections between two otherwise separate pipe systems, such as potable and nonpotable) also put your drinking water at risk.

**TAKE ACTION!**  
Always use an anti-backflow device when filling pesticide sprayer tanks to prevent the tank mixture from flowing back into the well and contaminating groundwater. Even if you have such a device, it is best to keep the hose out of the tank when filling the pesticide sprayer, or use a nurse tank which is filled with water at the well and then used to fill sprayers away from the well location.



# Well Cap

To prevent contaminants from flowing down the inside of the well casing, the driller installs a tight-fitting, vermin-proof well cap. Utah well code requires a vermin-proof cap or seal for all private wells. The cap should be firmly installed in a manner to prevent easy removal by children and entry by insects or surface water. Some wells have vents, allowing air to enter. If the well has a vent, be sure that it faces the ground, is tightly connected to the well cap or seal, and is properly screened to keep insects out. Check the well cap to see that it is in place and tightly secured. Wiring should be in the conduit. NOTE: Some wells may have pumping equipment attached at the surface rather than a well cap.

# Well Age

Well age is an important factor in predicting the likelihood of drinking water being contaminated. Wells constructed more than 70 years ago are still at the center of many homesteads. These may be shallow wells and are probably surrounded by many potential contamination sources. Older well pumps are more likely to leak lubricating oils, which can get into the well. Older wells are also more likely to have thinned and corroded casing. Even wells with modern casing that are 30 to 40 years old are subject to corrosion and pitting.

**TAKE ACTION!**  
Contact your local health department to have older wells inspected.



# MANAGING AN EXISTING WELL

Existing wells were often located according to traditional practices, based more on convenience than protection of drinking water. You may find that the current location of your well is not ideal because of the location of other practices on your property. Changing the location of other practices may be expensive or infeasible.

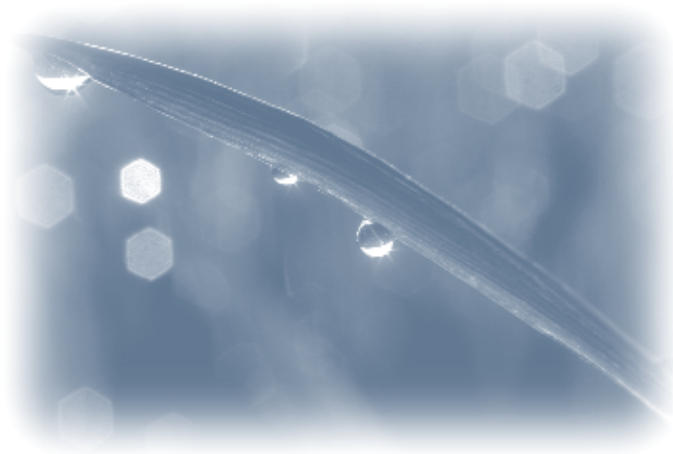
## Water Testing

Keep an eye on water quality in existing wells by testing them annually. Of course, you cannot have your water tested for every conceivable pollutant, but some basic tests can indicate whether or not other problems exist. Check with your local health department for contaminants that have been found in wells in your area. These may include heavy metals such as arsenic, inorganic chemicals, volatile organic chemicals, and pesticides that are used near your home. Some labs will also conduct an analysis of water to determine its suitability for livestock watering or irrigation.

Keep in mind that activities off your farm can affect your groundwater. Chemical spills, changes in land use, and the presence of landfills can increase the risk of pollutants getting into your water. If your water has a high nitrate or bacteria level, you may want to talk with your local health department about additional testing.

## Well Maintenance

Well equipment doesn't last forever. Every 10 to 20 years, your well may require mechanical attention from a qualified well driller or pump installer.



**UNTIL YOU CAN MEET ALL MINIMUM SEPARATION DISTANCE REQUIREMENTS, CHANGE THE WAY YOU MANAGE THESE TYPES OF STRUCTURES TO CONTROL CONTAMINANTS.**

**For example:**

- Install concrete curbs to direct livestock yard runoff away from the well;
- Locate manure piles on impermeable soil such as clay or, better yet, a concrete slab to reduce the chance of polluting your drinking water;
- Protect manure piles from rain or runoff from building roofs;
- Move traffic areas and chemical or petroleum storage areas away from the well;
- Adopt a routine maintenance and management schedule for your septic system.

## Keep Good Records

It is important to record test results and to note changes in water quality over time. In addition to water analysis test results, you should keep records of other activities that indicate what is happening with your water system. These include well construction details, dates, and results of maintenance intervals for the well and pump.

### **TAKE ACTION!**

At a minimum, test your water annually for bacteria and nitrate. This should be done after a period of heavy runoff. A good initial set of tests also includes corrosivity, hardness based on calcium and magnesium, pH or alkalinity, chloride, sodium fluoride, sulfates, electrical conductivity, and salts or total dissolved solids. Well owners considering investing in water treatment devices may also wish to determine the level of iron and manganese. In addition, you may choose to test your water for a number of specific contaminants that have been found in local groundwater.

# NEW WELLS

If your water is contaminated with certain highly toxic substances, such as benzene, it may be less expensive to construct a new well in a location that can provide uncontaminated groundwater than to attempt to clean up the aquifer you are presently using.

## HERE ARE SOME SIMPLE PRINCIPLES IN LOCATING A NEW WELL:

- Follow the state and local health department's recommended minimum separation distances (See table on pg. 2).
- Locate your well on ground higher than surrounding pollution sources such as fuel tanks, livestock yards, septic systems, or pesticide mixing areas. Follow minimum separation distances, and where practical, locate the well as far as possible from pollution sources.
- If necessary, build soil up around the well so that all surface water drains away from it. Avoid areas that are prone to flooding. Groundwater flow generally follows surface drainage patterns. Therefore, unless you know the exact direction of groundwater flow on your property, locate the well so that pollution sources are between the well and nearest creek, river, or lake.
- Make the well accessible for pump repair, cleaning, testing, and inspection.
- Hire a competent, licensed well driller and pump installer. It is best to designate in your contract who will be responsible for disinfecting the new well with chlorine after construction and testing the water (as required by state law).
- Be sure the contractor provides you with a copy of the well log that provides detailed information about the well's depth, construction, and yield. A thorough and complete well log can help you make future well management decisions and will assure a prospective buyer that the well was constructed properly and can be expected to provide safe drinking water.

# UNUSED WELLS

Many farms and ranches have unused or abandoned wells, such as shallow wells which were once pumped by windmills at old homesteads. Numerous wells that have been taken out of use as public water systems were developed in rural areas. Most of these wells remain unsealed. No one knows how many abandoned wells there are in Utah, although it is estimated to be in the thousands.

If not properly plugged and sealed, these wells can provide a direct conduit for surface water carrying pollutants to groundwater without filtering through soil, or allow contaminant movement from one aquifer to another.

### HAZARD!

Unused wells, especially dug wells, are sometimes used as cesspools for disposal of human wastes. This practice is extremely dangerous and is illegal in Utah. These large open wells also pose safety hazards for small children and animals.

Well abandonment must be accomplished under the direct supervision of a currently licensed water well driller. The well driller is responsible to verify that the procedures and materials are in accordance with the Utah Administrative Code. Call your local Water Rights office if you need more information.

Special equipment is often required to remove old pumps and piping and to properly install sealing material inside the well. Use of inappropriate methods or materials can lead to well settling, collapse, and continued groundwater contamination. If plugging materials are improperly installed in a well, it is nearly impossible to correct the defective work.

You may not know the history of your property, however, and unused well locations may not be obvious. Pipes sticking out of the ground around the homestead, in an area where a homestead used to be, or under an old windmill, are the most obvious places for finding abandoned wells. A depression in the ground may indicate an old well. Also, wells were often drilled in basements of houses, under front steps, or near old cisterns.

Well closing recommendations include:

- Remove pump, piping, and any other obstructions from the well.
- Close the entire length of unused wells with approved materials such as a slurry of neat cement or bentonite clay.
- The well should be chlorinated before it is sealed. The entire length of the well should then be sealed to prevent surface water from entering the groundwater, and to prevent contamination movement from one aquifer to another.

# CONTACTS AND REFERENCES

## CERTIFIED WELL WATER TESTING LABORATORIES

A list of certified well water testing laboratories is available from your local health department or county Extension office. Ideally, the lab that performs tests on your water will provide information about interpreting the results. However, your county Extension agent or local health department environmental scientist can provide additional assistance if needed.

## DRINKING WATER QUALITY STANDARDS

U.S. Environmental Protection Agency's Safe Drinking Water Hotline: Call toll free (800) 426-4791 from 10:00 a.m. to 4:00 p.m. Eastern time.

Utah Department of Environmental Quality, Division of Drinking Water: (801) 536-4200.

## WELL CONSTRUCTION OR INSPECTION

Qualified plumbers, well drillers, and pump installers can be found in your local yellow pages or online.

The Utah Division of Water Rights in Salt Lake City (801-538-7240) can verify that a contractor is licensed and bonded.

## LOCATION OF ARTESIAN AQUIFER RECHARGE AREAS

Utah Division of Drinking Water: (801) 536-4200

Utah Division of Water Rights: (801) 538-7240

## LOCAL HEALTH DEPARTMENTS

Environmental health scientists are available at local health departments to provide information about legal isolation distances and permits, local weather well regulations, and interpretation of water analysis, etc.

On the web: <http://www.eq.state.ut.us/eqdw/partners.htm>

Bear River Health Dept., Logan	(435) 792-6420
Central Utah Public Health Dept., Richfield	(435) 896-5451
Davis County Health Dept., Farmington	(801) 525-5000
Salt Lake Valley Health Dept., Salt Lake City	(385) 468-4100
Southeastern Utah District Health Dept., Price	(435) 637-3671
Southwest Utah Public Health Dept., St. George	(435) 673-3528
Summit County Public Health Dept., Coalville	(435) 333-1500
Tooele County Health Dept., Tooele	(435) 277-2301
TriCounty Health Dept., Vernal	(866) 275-0246
Utah County Health Dept., Provo	(801) 851-7525
Wasatch County Health Dept., Heber City	(435) 654-2700
Weber-Morgan Health Dept., Ogden	(801) 399-7160

## WATER TREATMENT DEVICES

Contact your county Extension office. For more information see the USU Extension Fact Sheet: Drinking Water Treatment Systems.

[http://extension.usu.edu/smac/files/uploads/DW\\_Systems\\_Jan2011.pdf](http://extension.usu.edu/smac/files/uploads/DW_Systems_Jan2011.pdf)

## OTHER QUESTIONS?

Contact Utah State University Water Quality Extension at (435) 797-2580, or <http://extension.usu.edu/waterquality/>

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# GLOSSARY

These definitions may help clarify some of the terms in this Fact Sheet. Also, they may help you make more accurate assessments when completing Survey #1.

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**ANTI-BACKFLOW DEVICES:** a check valve or similar mechanical device used to prevent the unwanted reverse flow of liquids back down a water supply pipe into a well.

**AQUIFER:** any underground layer of rock, gravel, or sand which is saturated with groundwater.

**ARTESIAN WELLS:** wells with water under pressure from a confining layer of clay or other impermeable material, which usually flows at the surface.

**BACKFLOW OR BACK SIPHONING:** the unwanted reverse flow of liquids in a piping system.

**BENTONITE CLAY:** an absorptive and colloidal clay used especially as a sealing agent.

**CISTERN:** artificial reservoir (such as an underground tank) for storing liquids and especially water.

**CONFINING LAYER:** any underground layer that has very low permeability to water.

**CORROSION AND PITTING:** deterioration leading to holes in the casing of a well.

**DRILLED WELLS:** wells created by drilling or jetting and driving, usually 6 to 8 inches in diameter.

**DUG WELLS:** wells commonly dug by hand which are generally larger than 2 feet in diameter.

**IMPERMEABLE:** not penetrable by the substance in question (water, petroleum, solvents, etc.).

**NURSE TANK:** a portable tank which can be used to transport water from the well to a mixing area.

**PERMEABILITY:** the degree to which a substance is penetrable by a liquid.

**POTABLE:** suitable for drinking.

**RECHARGE AREA:** an area where water penetrates the surface and flows to an aquifer.

**SCREENED VENT:** a ventilation hole for a well that is screened off to prevent rodents or debris from entering the well.

**SUBSURFACE GEOLOGIC MATERIALS:** rock, gravel, sand, silt, or clay materials below the ground surface.

**UNCONSOLIDATED FORMATION:** any loosely arranged geologic layer.

**VERMIN-PROOF WELL CAP:** a device to cover the top of a well that will keep all animals out.

**WELL CASING:** the liner between the well hole and the subsurface that keeps contaminants from flowing down into the water supply.

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