Home*A*Syst
Home Assessment System

Keeping your well water free of harmful contaminants is a top priority—for your health and for the environment. This assessment helps you examine how you manage your well and how activities on or near your property may affect your water quality.

This assessment covers:

1. ***Well location***
   - ***separation distances***
   - ***soil type***
2. ***Well construction***
   - ***well age***
   - ***well type***
3. ***Water testing and unused wells***
   - ***water testing***
   - ***abandoned wells***

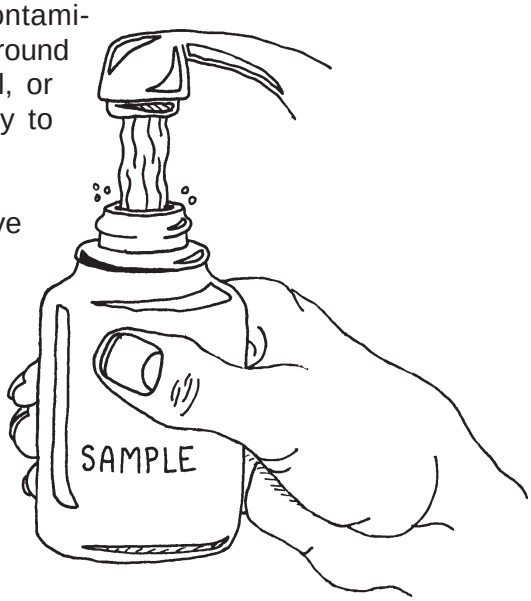
Oklahoma Cooperative Extension Service
Division of Agricultural Sciences and Natural Resources
Oklahoma State University

Drinking Water Well Management

Assessment Worksheet #2

Why should you be concerned?

Many Oklahoma residents use wells to supply their drinking water. These wells, which tap into local ground water, are designed to provide clean, safe drinking water. Improper construction or poor maintenance can create a pathway that allows fertilizers, bacteria, pesticides, or other foreign materials to contaminate the water supply. Once in ground water, contaminants can move with the ground water to a neighbor's well, or from a neighbor's property to *your* well.



Most contaminants, have no odor or color and are difficult to detect, so they can put your health at risk. They are also difficult and expensive to remove. If your water is contaminated, your only options may be to treat the water or get water from another source.

How will this worksheet help me protect my drinking water and home environment?

This worksheet is a guide to help you better understand the condition of your well and how to take care of it. It identifies situations and practices that are safe and some that may require prompt attention.

Part 1: Well Location

Your well's location in relation to other features on or near your property will determine part of your potential pollution risks. Nearness to sources of pollution and whether the well is uphill or downhill from those sources are the primary concerns. Fill out the assessment table at the end of this section to identify your well-location risks. You may find it helpful to refer to the map of your homesite made in Worksheet #1, Site Assessment. The map and the information below will help you answer questions in this assessment.

Recommended Minimum Separation Distances From Potential Sources of Contamination to Private Wells

Well

- **2 ft.** • Pump house floor drain draining to ground surface.
- **10 ft.** • Watertight sewer line (cast iron or approved plastic).
- **25 ft.** • Farm silo.
- **50 ft.** • Watertight sewer line (clay tile, orangeburg, etc.).
  • Septic tank, subsurface drain field or lagoon (downhill from the well).
  • House foundation (downhill from well).
  • Other potential or known sources of pollution, such as oil and gas wells, manure piles, landfills, etc. (downhill from the well).
- **75 ft.** • Septic tank, subsurface drain field or lagoon (same elevation as the well).
  • House foundation (same elevation as well).
  • Other potential or known sources of pollution, such as oil and gas wells, manure piles, landfills, etc. (same elevation as the well).
- **100 ft.** • Septic tank, subsurface drain field or lagoon (uphill from the well).
  • Septic tank, subsurface disposal field (soil percolation greater than or equal to one inch in less than five minutes).
  • Seepage pit.
  • Barnyard or feedlot.
  • House foundation (uphill from the well).
  • Other potential or known sources of pollution, such as oil and gas wells, manure piles, landfills, etc. (uphill from the well).
- **300 ft.** • Privies, cesspools, or other known sources of pollution.*

* For sources not addressed, provide as much separation as practical from the well. If the well is on a hillside or at the foot of a hill where pollutant sources are located, the corresponding separation value is a horizontal distance.

These distances constitute the minimum separation and should be increased in areas of fractured rock or limestone, or where the direction of ground water movement is from sources of contamination toward the well. These are distances in the well standards. Local waste storage ordinances may recommend or require different separation distances. *(Source: OAC 785:35-7.)*

What pollution sources might reach your well?

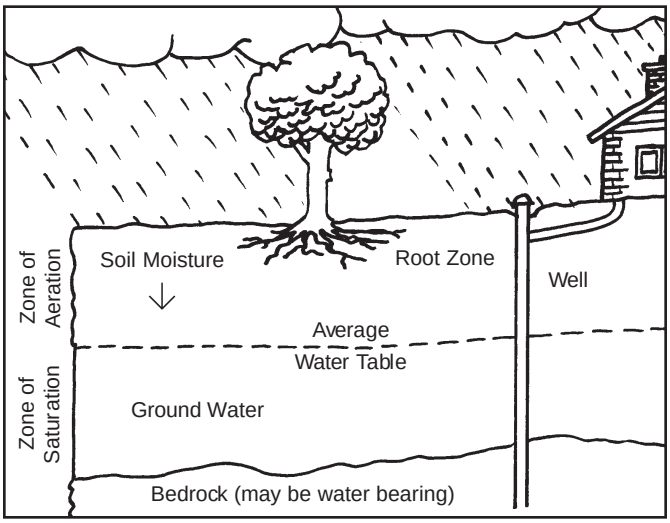
Whether ground water is just below the surface or hundreds of feet down, the location of your well is very important. Installing a well in a safe place takes careful planning and consideration of all potential pollution sources. All surface water (storm runoff, for example) should drain away from your well. If a well is downhill from a fuel storage tank, septic system, garden, or crop field, it has a greater risk of contamination than if it were uphill from these pollution sources because ground water usually flows in the same direction as the land slopes. Deep wells are usually better protected from surface contamination than shallow wells, but direction of flow is hard to predict for deeper ground water. Changing the location or depth of your well may protect your water supply.

Does your well meet separation distance requirements?

Oklahoma law requires a minimum separation distance from sources of pollution. Moving contamination sources away from your well reduces the chance of pollution, but it does not guarantee that the well will be safe.

What's underground—soil and bedrock type, distance to the water table?

Pollutant risks are greater when the water table is near the surface because contaminants do not have to travel far. Contamination is more likely if soils are thin (a few feet above bedrock) or if they are sandy. Shallow bedrock, particularly fractured bedrock, may carry water and contaminants quickly to your well. Clay layers or tight unfractured bedrock can protect your well from contamination. Check with neighbors, local farmers, or drilling companies to learn more about what's under your property. Also, read Home Site Assessment, Worksheet #1 for more information about soil type and ground water.



Assessment 1 — Risks Related to Well Location

Use the following table to rate your well-location risks. For each question, put the risk-level number (1, 2, or 3) in the column labeled "Your Risk." Although some choices may not correspond exactly to your situation, choose the response that fits best.

	1. Low Risk / Safest Situation	2. Medium Risk / Potential Hazard	3. High Risk / Unsafe Situation	Your Risk
Position of well in relation to pollution sources	Well is uphill from all pollution sources. Surface water flows away from well.	Well is uphill from most pollution sources. Some surface depressions can store water near well.	Well located downhill from pollution sources or in a pit or depression. Surface water accumulates near well.	
Separation distances between wells and pollution sources	Exceeds all state minimum required distances.	Meets minimum distance requirements.	Does not meet minimum separation distances for most or all potential sources.	
Soil type	Fine-textured soils, such as clay loams and silty clay.	Medium-textured soils, such as sandy clay loams and loams.	Coarse-textured soils, such as loamy sands and sands.	
Subsurface conditions	Water table deeper than 20 feet and protected by tight bedrock or clay.	Water table 10 to 12 feet deep. No clay or bedrock.	Water table or impermeable layer shallower than 10 feet.	

Responding to Risks—Your goal is to lower your risks. Turn to the Action Checklist on page 7 to record the medium- and high-risk practices you identified. Use the Low Risk category above to help you plan actions to reduce your risks.

Part 2: Well Construction and Maintenance

Old or poorly constructed wells have a risk of ground water contamination by allowing rain or surface water to reach the water table without being filtered through soil. If a well is located in a depression or pit or is not properly sealed and capped, surface water carrying nitrates, bacteria, pesticides, and other pollutants may flow directly into your drinking water.

You wouldn't let a car go too long without a tune-up or oil change. Your well deserves the same attention. Good maintenance means keeping the well area clean and accessible, keeping pollutants as far away as possible, and periodically having a qualified well driller or pump installer check the well when problems are suspected. Fill out the assessment table at the end of Part 2 to determine risks related to well construction or condition.

How old is your well?

Well age is an important factor in predicting the likelihood of contamination. Wells constructed more than 20 years ago are likely to be shallow and poorly constructed. Older wells are more likely to have thinner casings, which may be cracked or corroded. If you have an older well, you should have it inspected by a qualified well driller.

What type of well do you have?

A dug well is a large diameter hole, usually more than two feet wide, and often constructed by hand. Dug wells are usually shallow and poorly protected from surface water runoff. Driven-point (sand point) wells, which also pose a high risk, are constructed by driving lengths of pipe into the ground. These wells are normally around two inches in diameter and less than 50 feet deep and can only be installed in areas with porous soils such as sand. Drilled wells are commonly four to eight inches in diameter. Drilled wells are more likely to be safe because this type can penetrate layers of clay or bedrock.

Are your well casing and well cap protecting your water?

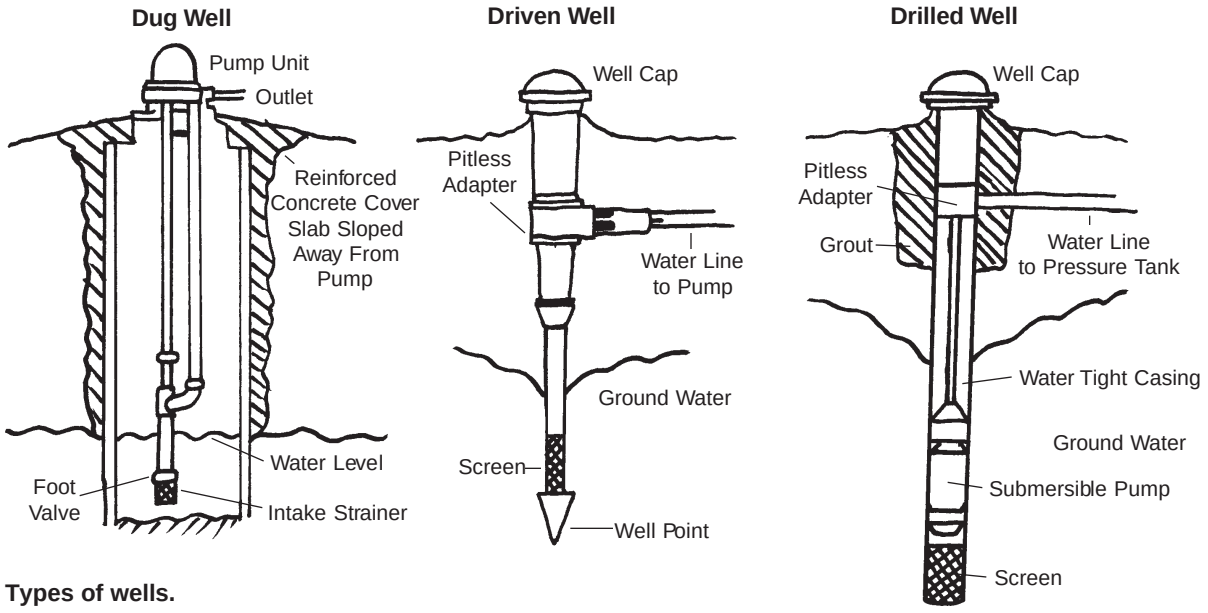
Well drillers install a steel or plastic pipe "casing" to prevent collapse of the hole during drilling. The space between the casing and sides of the hole can be a direct channel to the water table. To seal off that channel, drillers fill the space with grout (cement or a mixture of cement and a special type of clay called bentonite) and pour a two-foot concrete slab (see the diagram on page 4). A professional can visually inspect the condition of

your well casing for holes or cracks including the part that extends into the ground using a flashlight. If you can move the casing around by pushing it, you have a problem. Sometimes, damaged casings can be detected by listening for water running down into the well when the pump is not running. If you hear water, there might be a crack or hole in the casing, or your casing may not reach down to the water table. Either situation is risky.

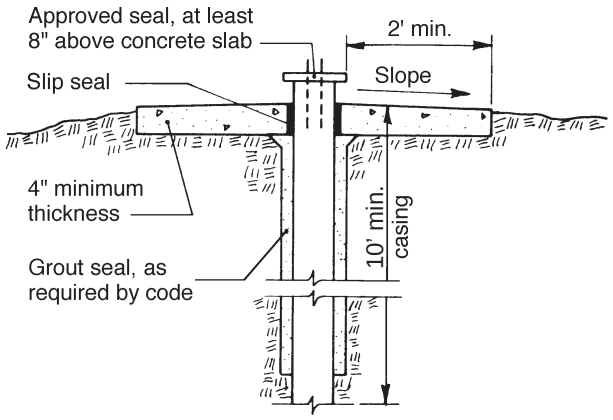
The depth of casing required for your well depends on the depth to ground water and the nature of the soils and bedrock. In sand or gravelly soils, well casings should extend to a depth of at least 10 feet, and should reach at least 10 feet below the water table. For wells in bedrock, the casing should extend through the weathered zone and into at least 10 feet of bedrock. A minimum of 10 feet of casing should be used for all wells. A cap should be firmly attached to the casing with a screened vent allowing only air to enter. Wiring for the pump should be secured in an electric conduit pipe. If your 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.

Is your well shallow or deep?

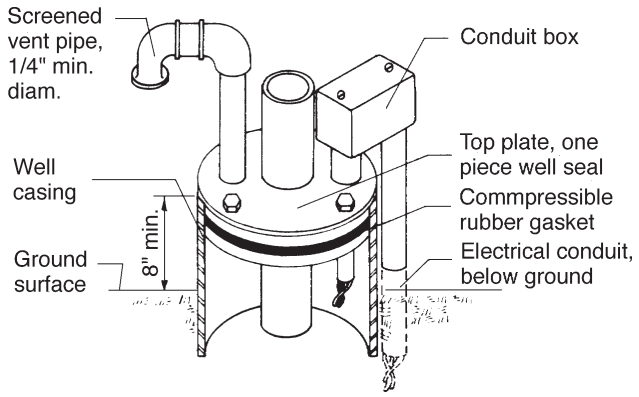
As rain and surface water soak into the soil, they may carry pollutants down to the water table. In some places, this process happens quickly—in weeks, days, or even hours. Local geologic conditions determine how long this takes. Shallow wells, which



Types of wells.



Recommended construction for water wells to protect the ground water supply from contamination.



A sanitary well seal with screened vent pipe to protect a water well from surface water, vermin, and foreign matter.

Source: Private Water Systems Handbook (MWPS-14). Midwest Plan Service, Iowa State University, Ames, Iowa. 1979.

draw from ground water nearest the land surface, are most likely to be affected by local sources of contamination. Deeper wells go farther into the water table or to deeper aquifers that are protected from surface contaminants.

Does your water-piping system have backflow prevention?

Backflow of contaminated water into your well can occur from back pressure or back-siphonage. Backflow prevention devices (check valves with vacuum breakers) should be installed on all faucets with hose connections. This reduces the risk of having contaminated water from toilets, laundry, appliances, sinks, swimming pools, irrigation systems, hot tubs, and garden hoses from reentering your plumbing. Inexpensive backflow preventers for faucets with hose connections can be purchased from hardware stores and plumbing suppliers.

How long since your well was inspected?

Well equipment doesn't last forever. Every 10 to 20 years, your well or pump will require attention from a qualified well driller or pump installer. You should keep well construction details and the dates and results of maintenance visits and water tests. It is important to**keep good records so you and future owners can follow a good maintenance schedule.**

Assessment 2 — Risks Related to Well Type and Condition

Use the following table to rate your risks related to well type, well casing, and backflow. For each question, put the risk-level number (1, 2, or 3) in the column labeled "Your Risk." Although some choices may not correspond exactly to your situation, choose the response that fits best.

	1. Low Risk / Safest Situation	2. Medium Risk / Potential Hazard	3. High Risk / Unsafe Situation	Your Risk
Well age	Less than 20 years old.	20 to 50 years old.	More than 50 years old.	
Well type	Drilled well, drilled deep through protective layer.	Shallow drilled well, less than 100 feet.	Dug well or driven well.	
Casing height above land surface	More than 8 inches above the surface.	At surface or up to eight inches above.	Casing at or below surface or in pit or basement.	
Condition of casing and well cap (seal)	No holes or cracks. Cap tightly attached. Screened vent.	No holes or cracks visible. Cap loose. Condition below ground unknown.	Holes or cracks visible. Casing loose or poor condition suspected. Cap loose or missing. Running water can be heard.	
Condition of concrete slab	Two-foot concrete slab in good condition.	Concrete slab cracked or deteriorated.	No concrete slab.	
Casing depth	Casing extends into deep bedrock or clay formation below land surface.	Casing extends 10 feet below minimum water level during pumping.	Casing extends less than 10 feet below minimum water level during pumping.	
Backflow prevention	Anti-backflow devices (check valves) installed on all outside faucets.		No anti-backflow device.	
Well inspection and "tune-up"	Well was inspected and water tested within the last 10 years.	Well was inspected and water tested 10 to 20 years ago.	Don't know when well was last inspected, or water tested, or well was inspected more than 20 years ago.	

Responding to Risks—Your goal is to lower your risks. Turn to the Action Checklist on page 7 to record the medium- and high-risk practices you identified. Use the Low Risk category above to help you plan actions to reduce your risks.

Part 3: Water Testing and Unused Wells

Water testing helps you monitor water quality and identify potential risks to your health. Contaminants may enter drinking water from many sources, such as improperly sealed wells. Improperly sealed, old, abandoned wells can provide a direct route for contaminants to enter ground water. It is important to identify older or abandoned wells and take appropriate action. Although this assessment focuses on local sources, contaminants can also come from sources outside your property boundaries. At the end of Part 3, fill out the assessment table to determine water quality risks related to water contaminants and old wells.

When was your water last tested?

Unless your well has low risk (determined in Part 2), your water should be tested each year for the two most common indicators of trouble—bacteria and nitrates. A full-spectrum, comprehensive, water test can tell you the basic characteristics of your water. A standard drinking water analysis for a private well will tell you about its hardness, alkalinity, pH, conductivity, total dissolved solids, chloride, sulfate, and nitrate content. In addition, you may choose to obtain a broad scan test of your water quality for other contaminants, such as pesticides. A list of certified labs is available from the DEQ or your county Extension office. If you have not tested your well, ask your neighbors what their tests have revealed.

What contaminants should you look for?

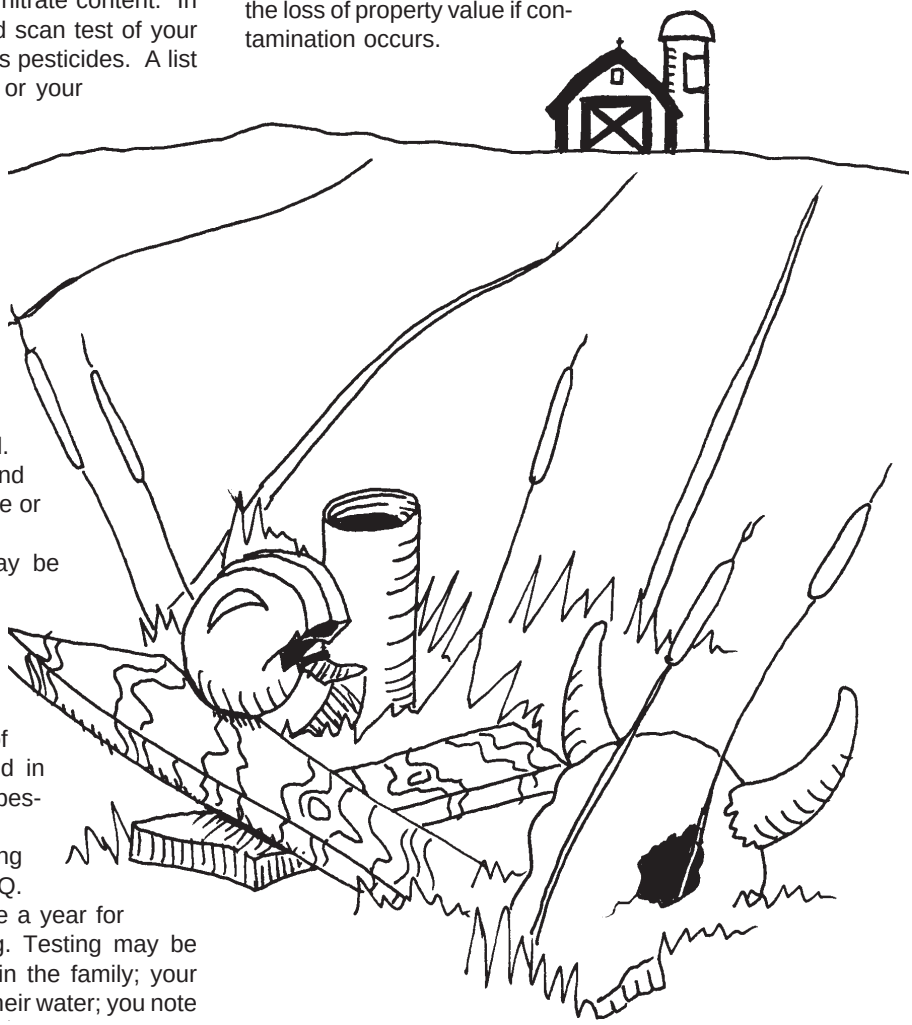
Test for the contaminants that have a chance of being found at your location. For example, if you have lead pipes, lead soldered copper pipes, or brass parts in your pump or fixtures, test for the presence of lead. Test for volatile organic chemicals (VOCs) and hydrocarbons if there has been a nearby use or spill of oil, liquid fuels, or solvents.

Pesticide tests, though expensive, may be justified if your well is located near an area where pesticides are handled, disposed, or used frequently, particularly if a pesticide spill has occurred near the well. Pesticides are more likely to be a problem if your well is shallow, has less than 10 feet of casing below the water table, or is located in sandy soil downslope from cropland where pesticides are used.

You can seek further advice on testing from your county Extension office or the DEQ. You should test your water more than once a year for nitrates if someone is pregnant or nursing. Testing may be needed if there are unexplained illnesses in the family; your neighbors find a dangerous contaminant in their water; you note a change in the water's taste, odor, color, or clarity; or you have had a spill or backsiphonage of chemicals or fuels into or near your well. Water can be tested by both public and private laboratories. Once tested, keep a record of your results to monitor water quality over time.

Are there any unused and abandoned wells on your property?

Many properties have wells that are no longer used. Sites with older homes often have an abandoned shallow well that was installed when the house was first built. If not properly filled and sealed, these wells can be a direct channel for waterborne pollutants to reach ground water. A licensed, registered well driller or pump installer should be hired to close these wells. Effective well-plugging calls for experience with well construction materials and methods, as well as knowledge of the geology of the site. Costs vary with well depth, diameter, and soil/rock type. The money spent sealing a well is a bargain compared to the potential costs of cleanup or the loss of property value if contamination occurs.



Assessment 3 — Water Testing and Abandoned Wells

Use the following table to rate your risks related to water quality and unused wells. For each question, put the risk-level number (1, 2, or 3) in the column labeled "Your Risk." Although some choices may not correspond exactly to your situation, choose the response that fits best.

	1. Low Risk / Safest Situation	2. Medium Risk / Potential Hazard	3. High Risk / Unsafe Situation	Your Risk
Water testing	Consistently good water quality. Frequent testing for bacteria, nitrate, and other contaminants meet standards.	Shallow well tested less frequently than every two years.	No water testing done. Water becomes discolored after rainstorm. Noticeable changes in color, odor, and taste.	
Unused wells	All unused wells properly sealed or none present.	Unused wells on or near property not sealed, but capped and isolated from contamination. Casing properly sealed and maintained for drinking water use.	Unused, unsealed well on or near property not maintained for drinking water.	

***Responding to Risks*—**Your goal is to lower your risks. Use the Action Checklist below to record the medium- and high-risk practices you identified. Use the Low Risk category above to help you plan actions to reduce your risks.

Action Checklist

When you finish the assessment tables, go back over the questions and list below every high and medium risk you identified. For each of these risks, write down the improvements you plan to make. Use recommendations from this worksheet and from resources elsewhere. Pick a target date that will keep you on schedule for making the changes. You don't have to do everything at once, but try to eliminate the most serious risks as soon as you can. Often it helps to start with inexpensive actions.

High and medium risks	Actions to reduce risk	Target date for action
Sample: Water hasn't been tested for for 10 years. Water has developed different odor.	Have sample tested by the Oklahoma Department of Environmental Quality (DEQ).	One week from today: November 7, 1997

Who to contact for help or more information about wells

Certified Well Water Testing Laboratories—A list of laboratories is available from the Oklahoma Department of Environmental Quality by calling 1-800-522-0206 or 405-271-4468.

Private Well Testing—For a test kit, call your county health department or your county DEQ office.

Cost to Have Your Well Tested—To find out the cost of analysis, call the State Environmental Laboratory at 405-271-5240.

Interpreting Well Water Test Results—Contact your county Cooperative Extension agent, DEQ laboratory, or county health department environmental specialist for an interpretation of test results.

Drinking Water Quality Standards—Call the Environmental Protection Agency's (EPA) Safe Drinking Water Hotline toll free at 1-800-426-4791 from 8:30 a.m. to 5:00 p.m.

Approved Water Treatment Devices—A list is available from the Oklahoma Cooperative Extension Service, Oklahoma State University, Stillwater, Oklahoma. Phone: 405-744-5653.

Requirements of Installation of Treatment Devices—Before installing treatment devices on water supplies contaminated with nitrates, heavy metals, VOCs, pesticides, microorganisms, and other health-related contaminants in excess of enforcement standards, contact the DEQ at 1-800-522-0206 or 405-271-4468.

Locating Possible Sources of Contamination—Qualified plumbers, well drillers, Oklahoma Water Resources Board (OWRB) district office water supply specialists (listed above), or county sanitarians can locate contamination sources and recommend improvements.

Well Construction or Inspection—Your OWRB district office or registered well drillers or pump installers can offer assistance.

A Copy of Your Well Construction Report—If a report was filed with the state, contact the OWRB at 405-530-8800.

Well Abandonment—Contact your district OWRB Water Management Division at 405-530-8800.

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The 72-page Private Water Systems Handbook, Fourth Edition (1979), MWPS-14, includes information on wells, ponds, springs, and other water supply systems and pumps, piping, and water treatment. This handbook is available from the Oklahoma Cooperative Extension Plan Service, Oklahoma State University, phone: 405-744-5425.

Related Fact Sheets

The following OSU Extension Fact Sheets are available from your local Cooperative Extension office:

Groundwater Quality and Treatment, F-1512
Pesticides in Ground Water, F-7459
Community Wellhead Protection Programs, F-890

*Other Oklahom*A*Syst publications*

The Oklahom*A*Syst Assessment system includes worksheets for owners of farms and ranches. The Farm & Ranch*A*Syst worksheet topics include:

1. Drinking Water Well Condition
2. Pesticide Storage and Handling
3. Fertilizer Storage and Handling
4. Petroleum Product Storage
5. Hazardous Waste Management
6. Household Wastewater Treatment
7. Swine, Dairy, and Beef Cattle Waste Management
8. Poultry Waste Management

For more information about Farm & Ranch*A*Syst, contact your local Cooperative Extension Office.

*Home*A*Syst Cares About Your Safety*

This Home*A*Syst assessment does not cover all potential risks related to drinking water wells which could affect health or environmental quality. There are other worksheets available on a variety of topics to help homeowners examine and address their most important environmental concerns.

This worksheet was adapted from Bill McGowan, Agriculture/Water Quality Extension, University of Delaware Cooperative Extension.

This publication, Home*A*Syst: An Environmental Risk Assessment Guide for the Home, NRAES-87, is available from National Regional Agricultural Engineering Services. Please contact NRAES for more information about the publication or about pricing and quantity discounts.

Northeast Regional Agricultural Engineering Services
Cooperative Extension
152 Riley-Robb Hall
Ithaca, New York 14853-5701
Phone: (607) 255-7654 Fax: (607) 254-8770
E-mail: nraes@cornell.edu