

# Rural Wellhead Protection Fact Sheet

## WATER WELL SETBACK DISTANCES

JUNE 1998

*Printed on recycled paper*

### INTRODUCTION

Why is the location of a private domestic well important? Frequently well locations are chosen based on convenience, not consideration of protecting domestic wells from potential contamination sources that may be in the area. Wells should be located at least some minimal distance away from any contaminant sources. The distance your well is away from a potential source of contamination is called the setback distance. Current activities or sources of contamination may need to be relocated to increase setback distances from the well to decrease the likelihood of contamination. This may include simple measures such as moving a fertilizer mixing area away from the wellhead, or more extreme measures such as moving an underground petroleum storage tank.

### REGULATIONS

Two State agencies have regulations concerning the proper siting of water supply wells. The Wyoming State Engineer's Office (SEO) has siting requirements, contained in the Regulations and Instructions, Part III, Water Well Minimum Construction Standards. It is the joint responsibility of the owner and the well driller to comply with the well siting requirements of the SEO. A copy of the SEO requirements can be ordered from the State Engineer's Office ((307) 777-7354).

The Department of Environmental Quality, Water Quality Division (WDEQ/WQD) regulates the construction of public drinking water supply wells through Chapter 12, Section 9.b. of the Wyoming Water Quality Rules & Regulations. However, WDEQ/WQD does not regulate the construction and siting of private domestic water wells. Contact the WDEQ/WQD can be contacted to obtain a copy of these regulations (In Cheyenne, (307) 777-7781).

Local County Health or Planning Departments may have additional or more stringent setback requirements. Local agencies need to be contacted prior to construction to identify and comply with local requirements.

### WHAT ARE THE RECOMMENDED SETBACK DISTANCES?

Recommended well setback distances from potential contaminant sources are provided in **Figure 1**. These setback distances are minimum suggested distances; it is highly recommended that these distances be exceeded wherever possible. Potential contaminant sources identified in **Figure 1** are sources of groundwater contamination that commonly are present in rural areas. Remember that the potential contaminant sources in **Figure 1** are not all inclusive, and that other sources of groundwater contamination may be present in your area.

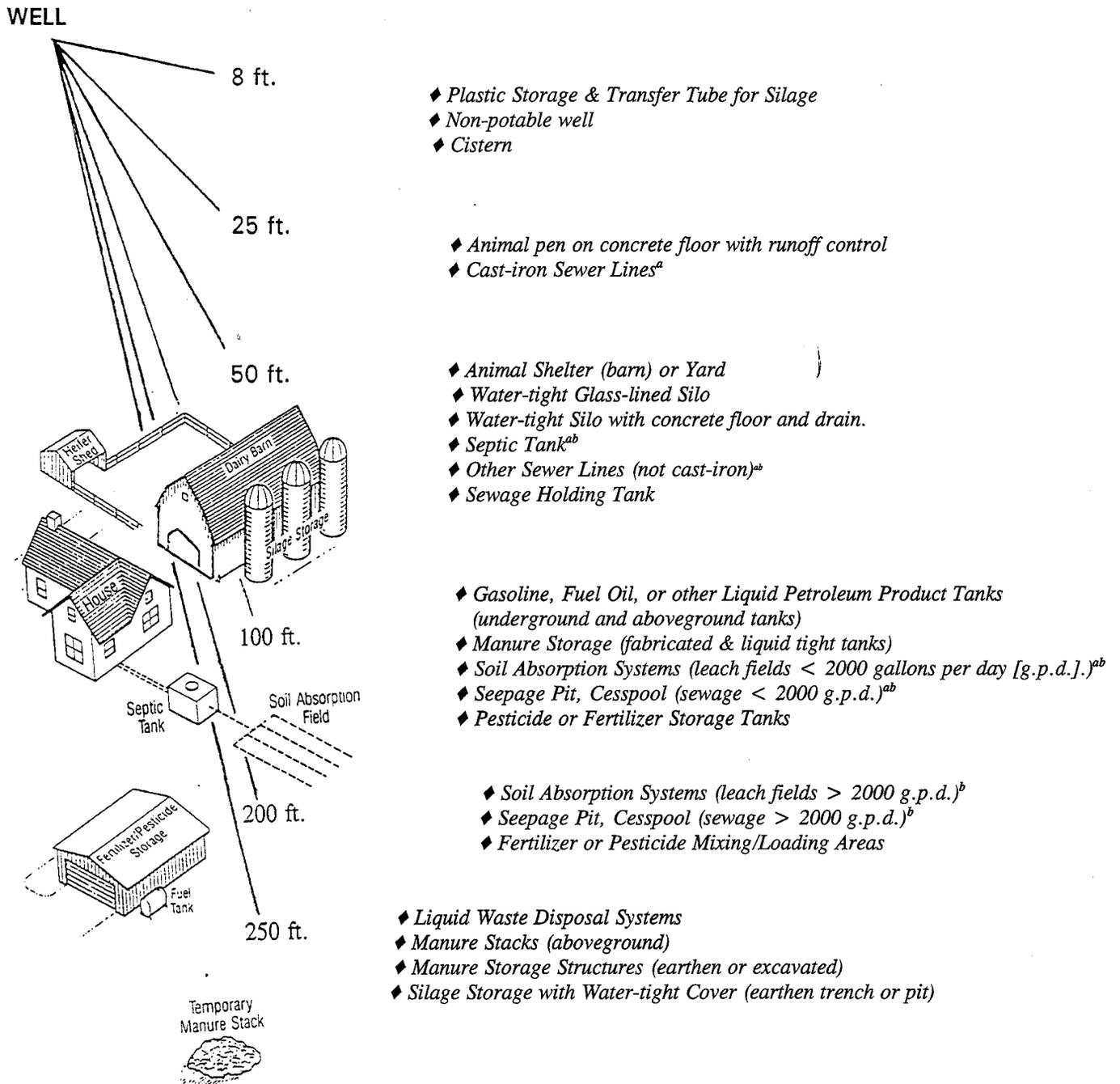
In addition, sources of contamination on adjacent property need to be taken into consideration, such as the location of a neighbor's septic tank and leach field. Your well should not be located near your property boundary; locating your well away from property boundaries ensures that you have control over use of land in the area surrounding your well.

### In what conditions are minimum setback distances inadequate?

Under some conditions, the minimum recommended setback distance that a domestic well should be located away from a particular type of contaminant source may not be conservative enough. Recommended setback distances may not be adequate in areas of Wyoming where the soil is highly permeable, such as areas where gravels and large grained sands are present and the depth to groundwater is fairly shallow (less than 25 to 40 feet), or where a thin layer of soil overlies fractured, faulted, or karst consolidated aquifers.

Examples of where these conditions may exist include the following areas. Highly permeable soils are present in alluvial valleys such as the North Platte River Valley and Salt River (Star) Valley. These alluvial valleys were formed by streams and rivers that deposited gravel, pebbles and coarse sandy sediments. Fractured bedrock and/or faulted conditions are present in various shallow aquifers

**Figure 1. Minimum Setback Distances.**



<sup>a</sup> Pursuant to the State Engineer's Regulations and Instructions, Part III, Water Well Minimum Construction Standards.

<sup>b</sup> Pursuant to Wyoming Water Quality Rules and Regulations, Chapter XI, Part D, Section 35 or Chapter XII, Section 9.b. for public water supply wells.

throughout Wyoming. Examples of fractures and fault zones are present in the Casper Formation on the west flank of the Laramie Range east of Laramie.

Septic tank and leach field wastewater systems may not function properly in areas where the soil is highly permeable and the depth to groundwater is fairly shallow (less than 25 to 40 feet), or where a thin layer of soil overlies fractured, faulted, or karst consolidated aquifers. Wastewater effluent from the leachfield will not be adequately filtered in permeable sands and gravels or in the thin soils above shallow consolidated aquifers before reaching the groundwater.

Contaminated groundwater can move very quickly in highly permeable formations or in fractured bedrock (for example, 1 - 10 ft. per day or 100's of ft. per day along fault zones). Typically, contaminants in groundwater are slowly diluted as they move through the subsurface. Groundwater contamination may not be significantly diluted within the minimum setback distance in highly permeable formations; therefore, greater setback distances are needed.

#### TOPOGRAPHIC CONSIDERATIONS

Wells should be located at a high point on your ranch/farmstead because surface water which may contaminate your well will flow towards topographic low areas. As mentioned previously, wells should be located upgradient from any potential sources of contamination. In general, groundwater flows in the same direction as surface water flow; therefore, topographic high areas may be protected from groundwater contamination.

#### HOW TO DETERMINE GROUNDWATER FLOW DIRECTION

If water table elevations in your area are known, or can be accurately measured at surveyed well locations, groundwater flow directions may be determined from these measurements. The U.S. Geological Survey (USGS) may have produced reports related to water supply aquifers in your area. These reports may provide relevant information about groundwater in your area such as the regional groundwater flow direction and average depth to groundwater. The USGS may be contacted in Cheyenne at (307) 778-2931.

The approximate depth to water can also be determined by referring to well completion information from wells

in the area from the State Engineer's Office (Cheyenne, (307) 777-7354).

---

#### **Contacts**

Wyoming Dept. of Environmental Quality, Water Quality Division, 122 W. 25th St. 4W, Cheyenne, WY 82002, (307)777-7781.

Wyoming State Engineer's Office, 122 W. 25th St. Herschler Bldg., 4E, Cheyenne, WY 82002, (307)777-7354.

Geological Survey of Wyoming, P.O. Box 3008, University Station, Laramie, WY 82071-3008, (307)766-2286.

U.S. Geological Survey, Water Resources Division, 2617 E. Lincolnway, Cheyenne, WY 82007, (307)772-2153.

U.S. Environmental Protection Agency, Region VIII, 999 18th St., Suite 500, Denver, CO 80202-2466, 1-800-227-8917.

University of Wyoming Water Resources Center, P.O. Box 3067, University Station, Laramie, WY 82071-3067, (307)766-2143.

#### Drinking Water Quality Standards

U.S. Environmental Protection Agency's Safe Drinking Water Hotline. Call toll free 1-800-426-4791 from 8:30 A.M. to 5:00 P.M. Eastern Time.

Water Quality Testing: Laboratories/Information  
County Health Departments or County Extension Agents.

Wyoming Department of Agricultural, Analytical Services, 1174 Snowy Range Road, Laramie, WY 82070, (307)742-2984.

**RURAL WELLHEAD PROTECTION WORKSHEET**  
**WATER WELL SETBACK DISTANCES**

**Assessing the Setback Distances of Your Water Supply Wells**

Summarize the potential sources of groundwater contamination in the blanks provided in **Table 1** on page 2 of this worksheet. Measure to the nearest 5 feet (ft) the distance from your drinking water supply well to each potential source. If you have a livestock water supply well or a second drinking water well, the setback distances from these wells should also be measured. If your water supply well is near your property boundary, include any potential sources that you know about on your neighbor's property.

After filling in the first four columns in **Table 1**, plot the sources on a scaled map of your ranch/farmstead. The map can be drawn to scale on gridded paper, or on an existing map or aerial photograph of your ranch/farmstead. If the groundwater flow direction is known, illustrate the flow direction on the map. The **Water Well Setback Distances Fact Sheet** explains where you can get information regarding the depth to groundwater and the groundwater flow direction for your ranch/farmstead near your water supply well. If groundwater flows from any potential contaminant source toward your water supply well, the source is upgradient of the well. If the groundwater flow direction is somewhat perpendicular to a line drawn between a potential contaminant source and your well, the contaminant source is described as being crossgradient from your well. If the groundwater flow direction is in a direction away from the well, the source is downgradient from the well. After the groundwater flow direction is drawn on the map, fill in the column in **Table 1** labeled, 'Is Source Upgradient of Water Well?'

Refer to **Figure 1** in the **Water Well Setback Distances Fact Sheet**, to verify whether the existing setback distances on your ranch/farmstead are adequate. If the setback distances of the sources you listed in **Table 1** do not meet or exceed the minimum setback distances in **Figure 1** of the **Fact Sheet**, your water wells may be threatened. If the source is upgradient from the water well the threat to your water well is greater. You may wish to consider whether or not the source or activity can be relocated or modified to improve the protection of your water supply.

---

After completing **Table 1**, answer the following questions.

1. Do you have the well driller's borehole log?  Yes  No

*If yes, review the borehole log. If no, review any available local geologic information to answer the following questions:*

A. Is your well in an alluvial valley, or do the subsurface and shallow soils consist of large gravels, pebbles, and coarse and medium-grained sands?  Yes  No

B. Is your well in a fractured or karst consolidated (rock) aquifer (i.e., fractured shale, karst limestone, etc.)?  
 Yes  No

If yes, what is the nature of the overlying soil layer and how thick is the layer? Nature: \_\_\_\_\_  
Thickness: \_\_\_\_\_ ft

---

If you answered yes to 1.A. or 1.B. and your well is downgradient of any contaminant source, the minimum setback distances in Figure 1 of the Fact Sheet may not be adequate; therefore, your drinking water supply may be at a high risk to groundwater contamination. If your water supply well does not lie downgradient of the potential source, but it is within a short setback distance (i.e., less than 10-30 ft.), it may also be at high risk to contamination under the soil conditions described above. Formations consisting of shallow, highly permeable fractured rock have the highest risk potential for groundwater contamination, and it is highly unlikely that the minimum separation distances shown in Figure 1 are adequate. If the sources are located over fractured bedrock, but there is at least 30 ft. of medium to fine textured (i.e., clays and silts) soils above the water table, groundwater would not be as vulnerable to contamination.

