

# **An Analysis of Private Water Systems and Single Lot Wells as they are Relative to Cluster Development**

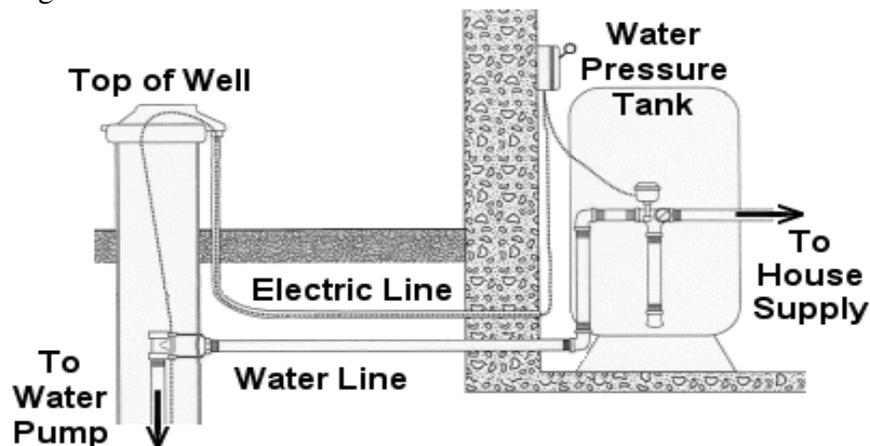
Any new or existing development in the Kinnickinnic Township can agree on the fact that there will always be a necessity for clean water. Those living outside a municipality or in an area not served by public water like the Town of Kinnickinnic, will typically get their water from a private well or a subdivision well. About 15 percent of Americans rely on their own sources of drinking water, such as wells, cisterns, and springs.

Water wells are usually installed by professional well-drillers, with the plumbing handled by a plumbing contractor. Regardless of whether the well serves a single home or multiple homes like in a cluster development, all wells should be up gradient from any nearby septic system to avoid contamination. Abandon wells are also considered hazardous if they are not plugged.

## **Types of Water Wells**

Water wells are vertical holes drilled into aquifers for the purpose of bringing water from the ground and pumping to the surface for our everyday water usage needs, like drinking, cleaning, and watering plants and crops. There are two basic kinds of water wells, shallow or deep. Shallow wells can go up to 100 feet deep, whereas deeper wells range from 100-400 feet deep. This is a diagram (Figure 1) showing the standard layout of the basic pump and pressure systems.

Figure 1



## **Shallow Wells**

Shallow wells are commonly used in areas with higher water tables. Most shallow wells would prove to be inadequate to support multiple homes in a cluster development. They are cheaper to dig, but they are susceptible to rapid changes in the water table due to large amounts of rain or long droughts. They are also more likely to be contaminated from surface contaminants. The two most common types of shallow wells are dug and driven.

## **Dug Wells**

Dug wells are hand-dug wells that are the oldest type of water well, the most shallow in depth, and have the greatest risk of being contaminated. Most of these wells are 3 to 6 feet in diameter and about 10 to 30 feet deep. The well pulls the water from the water-saturated zone above the bedrock. Brick tile, stones or other material are used to line the well, to prevent collapse while allowing water to enter. Then the hole is covered with a cap of wood, stone, or concrete. Dug wells should be checked often for contamination if it is used for drinking water.

## **Driven Wells**

Driven wells are a lot like dug wells, except they are deeper and constructed with lengths of metal pipes of 2-3 inches in diameter are assembled and driven into the ground. Driven wells are generally 30-50 feet deep, and are found where the ground water table is within 15 feet of the ground's surface. The best geologic settings are the areas with thick sand and gravel deposits. A screened "well point" located at the end of the pipe helps drive the pipe through the sand and gravel which also filters the sedimentation from the water. Even though these wells are deeper than the dug wells, they still have a moderate to high risk of contamination.

## **Deep (Drilled) Wells**

Drilled wells are by far the deepest, most modern, and the safest. Drilled wells are the ideal solution for a cluster development, as they can easily support 5-7 homes. They penetrate the ground about 100-400 feet, until the well goes into the bedrock. To serve as a water supply, a drilled well must intersect bedrock fractures containing ground water. The casing is usually metal or plastic pipe, six inches in diameter that extends into the bedrock to prevent shallow ground water from entering the well. While deep wells are less likely to be contaminated, routine testing of the water supply is still needed.

## **Problems and Causes**

The safety of any water supply is largely dependent on the construction and maintenance of the water system. Below is a list of common problems and their causes.

1. Rainwater can pick up harmful bacteria and chemicals on the land's surface. If this water pools near your well, it can seep into it, potentially causing health problems.
2. If the well pump turns on every time the water is in use, this usually means the system is leaking. Check the inside plumbing and the lawn for wet spots to determine the source of the leak.
3. If the well pump constantly turns on and off when being used, the water pressure tank is probably waterlogged, in which case it should be drained and re-pressurized.

## **Maintenance**

All shared and private wells should be checked for cracking, leaking, and contamination at least 2 or 3 times per year. The following maintenance procedures greatly reduce the risk of water contamination.

- Check for cracked, corroded, or damaged well casing.
- Check the electrical wiring to the well.
- Make sure the cap fits tightly and is in good condition.
- Check for signs of settling and cracking of surface seals.
- Test the well at least annually for coliform bacteria, nitrates, or other contaminants.
- Keep up to date and accurate records of well maintenance.
- Never dispose of harsh chemicals, solvents, petroleum, or pesticides near the well.
- Pump and inspect the well as often as recommended by local health department.

## **Well Construction**

There are simple construction guidelines and building materials that can be used for well construction that can reduce the problems associated with the above problems. All new wells should have the following features to prevent contaminants from traveling along the outside of the casing or through the casing and into the well.

1. The well should be lined with a watertight material and a cement grout or bentonite clay sealant poured along the outside of the casing to the top of the well.
2. The land surface around the well should be mounded so that surface water runs away from the well and is not allowed to pond around the outside of the wellhead.
3. The well should be covered by a concrete curb and cap that stands about a foot above the ground.
4. The pump should be located in your home or in a pump house, not in a pit in the ground.
5. Water-well drillers and pump-well installers should be bonded and insured. Make certain your ground water contractor is registered or licensed.
6. The following are sources of common contamination problems that must not be close to the well. The wellhead should be the following distances away from the associated problem according to experts.
  - Septic Tanks = 50 feet
  - Livestock yards, Silos, Septic Leach Fields = 50 feet
  - Petroleum Tanks, Liquid-Tight Manure Storage, Fertilizer Storage = 100 feet
  - Manure Stacks = 250 feet

## **Costs**

Due to the varying circumstances and the nature of drilling, the actual cost and installation of a deep well may differ. The average cost to drill well about 100 feet deep ranges between \$3,500 and \$6,000, depending on the soil and the contractor. Deeper and higher capacity wells could cost up to \$12,000. These costs can cover permits, transportation of equipment, drilling, casting, materials, grouting and cement, developing, test pumping, excavation, water analysis, and water treatment.

## **Funding**

The Wisconsin Well Compensation grant program provides financial assistance to replace, reconstruct or treat contaminated private water supplies. These grants only cover the costs if the well is privately owned and is less than 6 inches in diameter (deep wells), which is perfect for any cluster development. The State of Wisconsin covers 75% of the cost with a maximum of \$9,000. This money is eligible to cover:

- Water testing if the well was contaminated.
- Reconstructing a contaminated well.
- Construction of a new well.
- Connecting to an existing private or public water supply.
- Installing a new pump, including the associated piping.
- Properly abandoning a contaminated well.
- Equipment for water treatment if no other option is feasible.
- Providing a temporary water supply from bottles or trucks.