DEPARTMENT OF HEALTH

Using Surface Water Sources for Drinking Water

NONCOMMUNITY PUBLIC WATER SUPPLY PROGRAM

What is a Surface Water Source?

The Safe Drinking Water Act (SDWA), which sets many of the regulations for Public Water Systems (PWS), defines a surface water source as "all water which is open to the atmosphere and subject to surface runoff." This definition encompasses all lakes and rivers, both natural and manmade, as well as springs and Groundwater Under the Direct Influence of Surface Water (GWUDI).

Why Use a Surface Water Source for Drinking Water?

In Minnesota, Land of 10,000 Lakes, surface water sources are abundant, and you often don't need to go very far to find one. A nearby lake can be a consistent, year-round source of drinking water. Depending on the geology of your location, drilling a well can prove to be difficult and costly, sometimes resulting in poor water quality that makes the water difficult to use or insufficient water quantity to meet the needs of the PWS.

What are the Characteristics of Surface Water and Groundwater Sources?

Water quality can vary significantly between surface water and groundwater sources. Groundwater sources tend to have higher levels of dissolved minerals, such as calcium, magnesium, iron, manganese, or arsenic, than surface water sources. Depending on the concentrations of these minerals, treatment may be required to prevent scaling, staining, or health effects.

Groundwater sources are, however, generally less susceptible to microbiological contamination than surface waters. This difference is because groundwater percolates through layers of soil and rock before reaching the well, a process that filters out certain contaminants. Surface water sources, due to their susceptibility to microbiological contamination, require special treatment in the form of disinfection and filtration to remove or inactivate harmful microorganisms and prevent waterborne illness.

Surface water sources exhibit greater fluctuations in water quality than groundwater sources. Time of year, weather events, and human and animal activities can have dramatic effects on the characteristics of surface water. On the other hand, groundwater sources tend to be more shielded from seasonal fluctuations and activities on the surface. In general, you can expect temperature and turbidity (a measure of cloudiness) to remain relatively constant in groundwater sources year-round, whereas the same factors will exhibit a wide range throughout the year for a surface water source.

There is a special class of groundwater called Groundwater Under the Direct Influence of Surface Water (GWUDI). More common in areas where bedrock is close to the surface with little or no soil cover, such as northeastern Minnesota, these sources are significantly more susceptible to microbial contamination than traditional groundwater sources and may behave more similarly to surface water, requiring the same level of treatment.

Microbial Contaminants Found in Surface Water

All surface water sources are susceptible to contamination from human and animal feces. Microorganisms capable of causing waterborne diseases include viruses, bacteria such as *E. coli*, and protozoan parasites such as *Giardia* and *Cryptosporidium*.

- Giardiasis (*Giardia*) (https://www.health.state.mn.us/diseases/giardiasis/index.html)
- Cryptosporidiosis (*Cryptosporidium*) (https://www.health.state.mn.us/diseases/cryptosporidiosis/index.html)

Which Type of Water Source Should I Use?

The choice between whether to use a groundwater or surface water source for drinking water depends on several factors such as your location, your budget, and your ability to operate and maintain a treatment system.

Your location is important because of geological conditions and how they impact the feasibility of drilling a well. A well drilled in a known aquifer is likely to be cheaper, produce more water, and produce water of higher quality than a well drilled in an area dominated by shallow, fractured bedrock. It is recommended that you consult with your local well driller to assess the geological conditions in your area and determine if there is sufficient risk to warrant using a surface water source as an alternative.

The cost of drilling a well varies based on the geological material to be drilled into and the size of the well. A 300 foot well drilled into rock will be significantly more expensive than a 120 foot well drilled into soil and clay. Treatment equipment is another major expense if required. Many wells do not require any treatment, while some require treatment for contaminants that pose aesthetic or health-based impacts. It is recommended to consult with a local well driller or water treatment specialist to determine what type of water quality is common in your area and what type of treatment may be required.

Surface water sources will always require a sophisticated treatment system to meet the requirements of the Safe Drinking Water Act. At a minimum, treatment consists of chlorination and specialized filtration. Surface water treatment systems are specialized and costly, take up a significant amount of space, and require routine monitoring and maintenance. Using a surface water source involves investing in turbidity and chlorine residual monitoring equipment and conducting daily readings of each parameter.

Currently, all the noncommunity public water systems utilizing surface water sources are located in the northeastern portion of the state.

Regardless of which type of water source you use, it is always recommended that you have a water sample analyzed prior to putting the source into use.

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