

Water & Wastewater Systems on Permafrost

Special points of interest:

- Remove snow in the winter
- Provide shade in the summer
- No buried sewage or water tanks
- Leave natural vegetation
- Use an alternative wastewater system

*If it's frozen,
keep it frozen.
If it's thawed,
keep it thawed.*



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Keep it frozen

If your house is on permafrostⁱ, **you should do everything possible to keep your permafrost frozen.** Here are some steps you can take to preserve your frozen ground:

- **Shovel the snow away from your foundation.** Snow is a good thermal insulator, so removing it will allow more heat to escape from the ground during the winter, thereby decreasing the soil temperature and the thickness of the active layer that thaws during the summer.
- **Plant shrubs around the sunny sides of your foundation.** Shrubs shade the ground and minimize the soil's temperature rise during the summer months.

- **Keep warm tanks out of the ground.** This includes buried drinking water tanks, sewage holding tanks, septic tanks, and aerobic sewage treatment plants, whether they are insulated or not. This also includes leachfields – do not use them in permafrost.
- **Preserve natural vegetation.** The best insulation is the natural, undisturbed vegetative cover. Do not clear natural vegetation to plant grass because doing so will cause thermokarstsⁱⁱ to form and could jeopardize the house foundation. Keep disturbances such as driveways and parking areas to an absolute minimum.

Alternative wastewater systems

Use a wastewater system designed for permafrost. Choose from one of the following:

- **Outhouseⁱⁱⁱ for human waste and a 5-gallon bucket for sink water** – for those who want a rustic, Alaska experience and are willing to endure -50°F, this is the way to go (fast)! Technically, to meet Alaska Dept. of Environmental Conservation (ADEC) regulations, you must filter and disinfect the sink water (graywater) before discharging it. However, even without doing that, if you keep most food particles out of the water and disperse it to vegetated areas, graywater can be discharged without harming the environment.
- **Indoor waterless toilet** – for those who want the convenience of an 'inhouse' instead of an outhouse. These toilets, made in Sweden by Separett®, are available at Lifewater Engineering Company. They vent to the outside of the house with a very low wattage fan (12V, 24V, or 110V). In these toilets, urine is kept separate from the solids.

Water is evaporated from the solids, and then the solids can be burned in a woodstove or disposed with other solid waste^{iv}.

- **Above ground sewage treatment plant that keeps heat out of the ground** – those who want a standard flush toilet, kitchen sink, laundry, etc., should use a

sewage treatment and disposal system that is specifically designed for homes on permafrost. Because these systems are above ground, they are easy to install and can be installed at any time of year. Because they discharge to natural vegetation, there is essentially no disturbance to your yard.

Beware before buying a house on permafrost

If you are buying a house on permafrost

If you are considering buying a house on permafrost, keep these tips in mind:

- If the house has a permafrost foundation and a septic system or buried drinking water tank, **beware**. Soil that requires a permafrost foundation is generally unsuitable for warm, buried tanks and leachfields. It is likely that the septic system will fail in a few years and the drinking water will become contaminated (see next item).
- We recommend NOT burying drinking water holding tanks in permafrost for the following reasons:
 - In the fall, as the soil freezes from the top down, frost jacking pulls the fill and vent pipes upwards, causing

stress on the fittings where the pipes join the tank. In the spring, when snowmelt or rain infiltrates the soil near the tank, buoyancy pushes the tank upwards against the fill and vent pipes, stressing the fittings in the opposite direction. These repetitive stresses eventually cause the fittings to leak, allowing contaminated shallow groundwater to enter the tank.

- Burying a tank in or above permafrost results in a major disturbance to the natural vegetation in your yard. This upsets the thermal balance, and generally causes the permafrost to thaw.

To get more information about living on permafrost and discuss sewage treatment options, please call Lifewater Engineering Company at 1.866.458.7024 (in the Fairbanks area call 458.7024). We will help you make wise, informed decisions!



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ⁱ Permafrost is soil that has remained frozen (colder than 32°F or 0°C) for a period of two or more years.
ⁱⁱ Thermokarsts are small to large pits and depressions that form as a result of melting ground ice. Water puddling in thermokarsts increases that rate of thawing, thus once thermokarsting begins it will likely continue and may accelerate.
ⁱⁱⁱ ADEC regulations in 18AAC72 require that the bottom of the outhouse hole be at least 4 feet above the annual high groundwater elevation.
^{iv} If dried solids are disposed with other solid waste, it is good practice to add some gardening lime to the plastic bag to raise the pH and kill the pathogens.

