

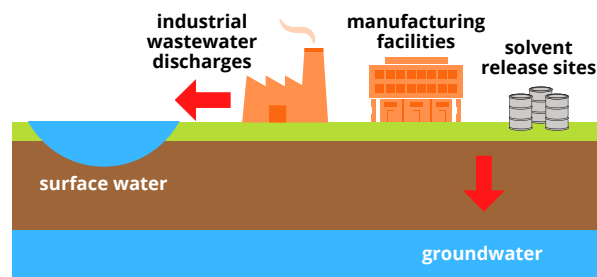
1,4-Dioxane Factsheet and Treatment Information

What is 1,4-dioxane?

1,4-Dioxane is an industrial chemical that is mainly used in chlorinated solvents, which are found in paint thinners, dyes, greases, personal care products, and dry cleaning operations (EPA 2017). 1,4-Dioxane is also used as a solvent in manufacturing, and it is a by-product that forms during the production of some plastics and surfactants present in consumer products like detergents and shampoos.

Where is 1,4-dioxane found in the environment?

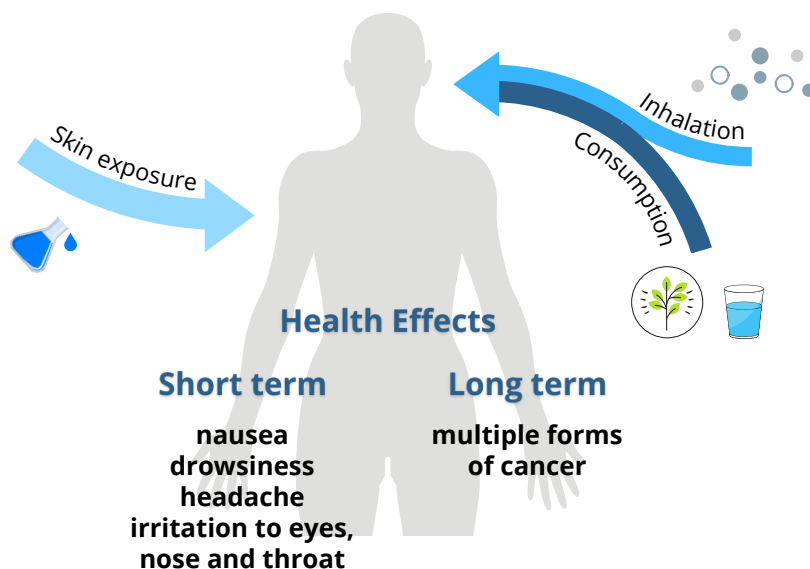
1,4-Dioxane is found in groundwater near solvent release sites and manufacturing facilities. It is also found in surface water impacted by industrial wastewater discharges. 1,4-Dioxane spreads quickly through soil and water, and it is persistent, meaning it stays in groundwater for a long time. 1,4-Dioxane is not known to bioaccumulate in the food chain, which means we don't find more of it the higher up we look in the food chain (EPA 2017).



How are humans exposed to 1,4-dioxane? What are the health effects?

1,4-Dioxane can enter the human body through inhalation and ingestion (e.g. drinking water or eating food contaminated with 1,4-dioxane). People can also be exposed to 1,4-dioxane through the skin.

People who work directly with chemicals and solvents in the workplace and people drinking water contaminated with 1,4-dioxane have higher risks of exposure to 1,4-dioxane than the rest of the population (EPA 2017).



Is 1,4-dioxane regulated in drinking water?

The EPA established a health advisory level of 0.35 micrograms per liter (ug/L) of drinking water (ug/L), but it is not enforceable. Many states have established drinking water and groundwater criteria for 1,4 dioxane, but with the exception of New York's maximum contaminant level of 1 ug/L, all are non-enforceable (EWG 2021).

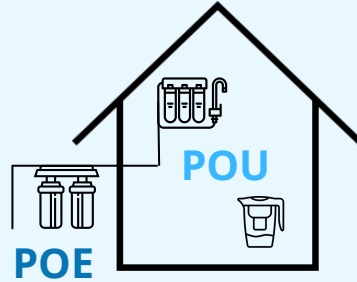


What are your options for at-home 1,4-dioxane drinking water treatment filters?

In-home filters can either be **Point of Entry (POE)** or **Point of Use (POU)**.

POE filters are installed on the main water supply. They filter **all** the water coming into your home.

- higher upfront cost
- may need professional maintenance



POU filters are installed at the tap or are used as pitcher filters. They usually filter water for cooking or drinking.

- lower upfront cost
- easier to install
- regular filter replacement

A recent study from NC State looked at different POU water filters and compared how well they removed 1,4-dioxane:



POU under-the-sink Reverse Osmosis

All POU RO filters tested removed 1,4-dioxane below the EPA health advisory of 0.35 ug/L.



POU under-the-sink Granular Activated Carbon (GAC)

All POU under-the-sink GAC filters* tested removed **some** 1,4 dioxane.

2/3rds of those tested removed enough 1,4-dioxane for levels to be below the EPA health advisory of 0.35 ug/L.

*These filters are less reliable at 1,4 dioxane removal when concentrations fluctuate, which can happen when drinking water is produced from surface water.



Whole-house (or POE) filters

No point-of-entry GAC filters tested removed 1,4 dioxane below the EPA health advisory level of 0.35 ug/L.



POU GAC filters in refrigerators, faucets, and water pitchers can partially remove 1,4-dioxane.

1,4-Dioxane Water Treatment Takeaways

- **POU RO filters are effective at removing 1,4 dioxane even if levels in your home vary.**
- **Having some removal of 1,4 dioxane is better than having no removal of 1,4 dioxane from drinking water.**
- **Whole-house GAC filters are not recommended for homes served by public water systems.** They are less effective in removing contaminants than POU RO filters. Also, whole-house GAC filters remove the disinfectant residual and leaves the house's plumbing unprotected. As a result, harmful bacteria can start growing in the pipes of your home.

Sources:

1. Environmental Protection Agency (EPA). [Technical Fact Sheet - 1,4-Dioxane](#), 2017.
2. Environmental Working Group (EWG). [1,4-Dioxane](#), 2021.
3. Knappe, et al. [Removal of PFAS and 1,4-dioxane in home filters under field conditions](#), 2022.
4. Knappe, et al. Water Resources Research Institute (WWRI). [Occurrence of 1,4-Dioxane in the Cape Fear Watershed and Effectiveness of Water Treatment Options for 1,4-Dioxane Control](#), 2016.
5. McElroy, et al. [1,4-Dioxane in drinking water: emerging for 40 years and still unregulated](#), 2019.

