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1,4-Dioxane and Drinking Water

1,4-Dioxane has historically been used as a stabilizer for chlorinated solvents, especially trichloroethane. This compound is also present in some consumer products such as shampoos, toothpastes, deodorants and other personal care products. 1,4-Dioxane is generally not listed as an ingredient in personal care products that it can be detected in. It is a contaminant in these products that forms as part of secondary reaction when ethylene oxide is added during the manufacturing process. Ethylene oxide is added to make the cleaning agents in personal care products less harsh or abrasive.

Drinking Water Health Standards

RSA 485-C:6 requires the New Hampshire Department of Environmental Services to establish an ambient groundwater quality standard (AGQS) based on a one-in-one-million cancer risk when the federal government indicates such a risk exists for a particular contaminant.

In 2005, DES adopted an AGQS for 1,4-dioxane of 3.0 µg/L based on information provided by the US Environmental Protection Agency's Integrated Risk Information System (IRIS) toxicological review. By regulation, ambient groundwater quality standards are also considered drinking water standards if a Maximum Contaminant Level standard has not been developed for a particular compound.

After a nearly three-year review period, the IRIS Program published a revised toxicological review in 2010 for 1,4-dioxane, which lowered the concentration of 1,4-dioxane in drinking water that would cause a one-in-one-million cancer risk from 3.0 µg/L to 0.35 µg/L. DES has not adopted a new regulation that would enforce a drinking water standard of 0.35 µg/L for 1,4-dioxane at this time.

Assessing the Occurrence of 1,4-Dioxane in Drinking Water

In March 2011, DES sent water systems information regarding the potential health effects regarding 1,4-dioxane. DES requested that community water systems and non-transient public water systems voluntarily sample their water sources for 1,4-dioxane and to share this data with DES. The department is maintaining a list of labs (table 1) that have confirmed they can analyze 1,4-dioxane in drinking water with a laboratory reporting limit of 0.30 µg/L or less. DES is also amending its approvals associated with permitted groundwater discharges and waste management sites to require that groundwater be analyzed for 1,4-dioxane using a reporting limit of 0.30 µg/L or less. It is also anticipated that EPA will include 1-4-dioxane in the list of analytes

that will be tested for in the third round of unregulated contaminant monitoring for community water system in the next couple years.

Treatment Options for 1,4-Dioxane

Suitable treatment methods are not known to be readily available for reducing 1,4-dioxane in drinking water to a concentration that is below 0.35 µg/L. Granular activated carbon has been used by some drinking water systems to reduce the concentration of 1,4-dioxane to concentrations of less than 3.0 µg/L, but the performance of these treatment systems has not been consistently reliable. Research has shown that treatment methods using various combinations of ultra-violet light, ozone and hydrogen peroxide have been very effective in reducing the concentration of 1,4-dioxane in drinking water although studies have not generally focused on reducing the concentration of 1,4-dioxane below 0.35 µg/L.

1,4-Dioxane Regulation in New Hampshire Looking Forward

DES intends to assess the additional sampling data obtained from public water systems, groundwater discharge sites and permitted waste management sites. After developing a better understanding of the occurrence of low concentrations of 1,4-dioxane in drinking water and groundwater throughout New Hampshire, DES can collaborate with stakeholders to formulate and recommend appropriate policies that will achieve an appropriate balance among human health, environmental and economic impacts.

Additional Information

DES fact sheet “ARD-EHP-30 1,4-Dioxane” on health aspects:

<http://des.nh.gov/organization/commissioner/pip/factsheets/ard/documents/ard-ehp-30.pdf>

California: <http://www.cdph.ca.gov/certlic/drinkingwater/Pages/1,4-dioxane.aspx>

USEPA Integrated Risk Information System: <http://www.epa.gov/iris/subst/0326.htm>