1,4-Dioxane in our Water Resources – Fact Sheet
Prepared by the Suffolk County Department of Health Services
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Background/Introduction
1,4-Dioxane is a synthetic chemical that has many uses (see below). It moves readily through soil, completely mixes with groundwater and it does not readily biodegrade in the environment. Based on a preliminary evaluation, 1,4-dioxane appears to be of particular concern in Suffolk County due to the presence of historic sources and groundwater plumes in our sandy, sole source aquifer.

What are Some Past and Current Uses of 1,4-Dioxane?
- 1,4-Dioxane was used as a solvent and a chlorinated solvent stabilizer for industrial chemicals, predominantly 1,1,1-trichloroethane (TCA). TCA was also used as a degreasing agent in cesspool additives, which have been banned in Suffolk County since 1980.
- Other solvent applications include those for cellulose acetate, dyes, fats, greases, lacquers, mineral oil, paints, resins, varnishes, and waxes.
- 1,4-Dioxane is also used as a wetting agent and dispersing agent in textile processing, dye baths, stain and printing compositions, and in the preparation of microscope slides.
- Additionally, 1,4-dioxane is used in cosmetics, deodorants, fumigants, automotive coolant liquid, and radiation detectors.
- Residues may also be present in detergents, shampoos, food additives, food packaging materials or on food crops treated with pesticides that contain 1,4-dioxane.

How Does 1,4-Dioxane Enter the Environment?
- Due to the widespread historical use of chlorinated solvents on Long Island, 1,4-dioxane would be expected to be found in groundwater polluted with these solvents. Known sources of 1,4-dioxane releases include unintended spills, leaks, historical disposal practices of TCA, septic system, cesspool and wastewater discharges potentially via personal care products, and car washes.
- According to the United States Environmental Protection Agency (US EPA) Toxics Release Inventory, there have been 60 1,4-dioxane releases to the air, soil and water reported in New York State since 1987. None were reported in Suffolk County.

What are the Potential Health Effects of Exposure to 1,4-Dioxane?
All chemicals can cause health effects. The risk for adverse health effects from exposure to any chemical depends on many factors including the chemical’s toxicity, the amount of the chemical to which a person is exposed, and how long and how often the exposure occurs. Below is some general information about the kinds of health effects that may be associated with exposure to 1,4-dioxane.
- Most of what we know about the potential health effects of exposure to 1,4-dioxane in humans comes from studies in occupational settings, where people were exposed to levels much higher than would be expected from environmental exposures, such as through drinking water. These occupational studies indicate that breathing relatively high concentrations of 1,4-dioxane in air may cause nausea, drowsiness, headache and irritation of the eyes, nose and throat. In addition, liver and kidney toxicity have been reported.
- Liver and kidney effects have been observed in laboratory animals after long-term oral exposure to levels of 1,4-dioxane that are higher than typical environmental exposure. Some laboratory animals that were exposed to 1,4-dioxane in drinking water over their lifetime developed cancer from levels that are much higher than has been detected in Suffolk County drinking water. Whether 1,4-dioxane causes cancer in humans is unknown; however chemicals that cause adverse health effects in animals after high levels of exposure may pose a risk to humans exposed to lower levels over long periods of time. Therefore, the US EPA classifies 1,4-dioxane “likely to be carcinogenic to humans” based on the results of animal studies.
Are there Standards or Health-Based Criteria for 1,4-Dioxane in Drinking Water?

- There is currently no chemical-specific Federal or New York State drinking water standard for 1,4-dioxane; however it is regulated as an Unspecified Organic Contaminant by the New York State Department of Health (NYSDOH) at a maximum contaminant level (standard) of 50 parts per billion (ppb).
- The US EPA has estimated the concentration of 1,4-dioxane in water corresponding to an increased lifetime cancer risk of one-in-a-million, assuming consumption of 2 liters of water per day each and every day for a lifetime (70 years), which is 0.35 ppb. This health-protective criterion is often used as a non-regulatory benchmark for minimal risk.

Has 1,4-Dioxane Been Detected in Suffolk County’s Public Drinking Water?

- Data released by the US EPA from 2013 and 2014 showed that 40 public water supplies in New York State contained 1,4-dioxane, and that 31 of these are located on Long Island.
- The Suffolk County Water Authority (SCWA) first began testing for this compound in 2003. Recent SCWA data indicate that 1,4-dioxane was detected in approximately 272 public water supply wells, or roughly 40% of their wells sampled from January 2013 through October 2014. Where possible, SCWA is blending water from more than one drinking water well to reduce the overall concentration of 1,4-dioxane going to their customers. Detections in water pumped from the Suffolk County Water Authority pump stations in 2014 ranged between 0.07 ppb and 5.44 ppb. The average concentration of all samples collected in water pumped from SCWA pump stations in 2014 was 0.22 ppb.
- The detections of 1,4-dioxane in water samples collected in the other major Suffolk County water districts as identified in the October 2014 UCMR3 data release ranged between 0.071 and 1.3 ppb. The average concentration of all non-SCWA samples was 0.16 ppb.

What is Being Done to Protect the Public in Suffolk County from 1,4-Dioxane?

- The Suffolk County Department of Health Services (SCDHS) Public and Environmental Health Laboratory has the capability to analyze water samples for 1,4-dioxane. Routine analysis of public and private water supply wells, bottled water, surface water and test well samples was initiated on March 30, 2015. Targeted groundwater monitoring programs will be conducted to determine if 1,4-dioxane in personal care products and other possible sources might impact groundwater.
- The SCDHS and the NYSDOH are currently reviewing a proposal by the SCWA to conduct a full scale advanced oxidation process (AOP) pilot test to remove 1,4-dioxane at one of their facilities. If approved for installation, this project will involve injecting hydrogen peroxide into the raw water containing 1,4-dioxane and passing it through an ultraviolet light reactor that promotes rapid oxidation of the chemical. The proposal includes a final step of granular activated carbon to remove any residual hydrogen peroxide and other possible contaminants not oxidized as part of the AOP.
- The Federal Consumer Product Safety Commission continues to monitor for 1,4-dioxane in consumer products and legislation has been proposed to regulate and restrict chemicals such as 1,4-dioxane. Many personal care product companies are beginning to voluntarily remove this chemical from their products.
- The New York State Department of Environmental Conservation (NYSDEC) is proposing an ambient water quality standard for 1,4-dioxane. If adopted after public hearings, the standard would apply to groundwater and surface waters classified as being a source of potable water supply, e.g., Long Island groundwaters.
- The NYSDOH is considering setting a chemical-specific drinking water standard for 1,4-dioxane, which is currently covered by the New York State Unspecified Organic Contaminant standard of 50 ppb. Occurrence data, treatment options, and the toxicity of the compound are being reviewed as part of the process of determining whether a standard is needed and practical.

What Should I Do if I Have a Private Well and I’m Concerned about 1,4-Dioxane?

- You can have your water tested by a New York State Environmental Laboratory Approval Program (ELAP) certified laboratory for 1,4-dioxane. At least two local laboratories can perform this analysis, Long Island Analytical Laboratories and Pace Analytical Services. The cost of the analysis varies, but current costs are approximately $250 to $300 per sample. SCDHS also expects to be able to conduct the analysis for private well homeowners in 2015. Please contact the SCDHS-Office of Water Resources at (631) 852-5810 for more information.
• If you have 1,4-dioxane in your private well and you want to reduce your exposure:
  o Drink NYSDOH-certified bottled water.
  o Reduce the amount of time spent in the bath or shower.
  o Discuss treatment options with a qualified filtration specialist. The chemical characteristics of 1,4-dioxane make it difficult to remove using conventional treatment. Granular activated carbon and reverse osmosis have only limited success in reducing concentrations.
  o Whenever possible, connect to public water. Public water suppliers are regulated by the US EPA, NYSDOH, and SCDHS and continuously test their water for a suite of different contaminants. Public water supplies have several options available to reduce concentrations of 1,4-dioxane that may not be cost-effective to a homeowner with a private well including blending the water with another well source or complex, innovative technologies such as advanced oxidation.

Where Can I Find More Information about 1,4-Dioxane?
• Water Research Foundation. 2014. “1,4-Dioxane White Paper.” http://www.waterrf.org/resources/StateOfTheScienceReports/1,4-dioxane.pdf