EMERGING CONTAMINANT: **1,4-DIOXANE**

*What is **1,4-Dioxane?***

1,4-Dioxane is a synthetic industrial chemical which is completely miscible in water. It is highly mobile in groundwater and is not shown to be readily biodegradable in the environment.

It is classified by the U.S. EPA as likely to be carcinogenic to humans by all routes of exposure. Currently, there is not a federal maximum contaminant level established for 1,4-Dioxane in drinking water, but many states are developing recommended limits.

***1,4-Dioxane** Sources and Uses*

- Used as a stabilizer for chlorinated solvents, particularly 1,1,1-trichloroethane (TCA)
- Found in products, such as paint stripper, dye, grease, varnish, wax, antifreeze, aircraft deicing fluid, and in consumer products, including deodorant, shampoo, and cosmetics
- Used as a purifying agent in the manufacture of pharmaceuticals
- Is a byproduct of the manufacture of polyethylene terephthalate (PET) plastic
- May be present in some food supplements, food containing residues from packing adhesives, or on food crops treated with pesticides that contain 1,4-Dioxane as a solvent or inert ingredient

Although many sources of 1,4-Dioxane are no longer in use, its physical and chemical properties allow it to remain in groundwater for years after initial contamination.

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(continued)

The Solution: *Calgon Carbon UV Technologies*

Calgon Carbon UV Technologies has more than 30 years in advanced oxidation experience, and over 20 systems installed for treatment of 1,4-Dioxane in groundwater remediation and drinking water applications. Calgon Carbon UV uses high powered medium-pressure lamps in conjunction with hydrogen peroxide or chlorine for the most efficient and smallest footprint option available.

The Company's 30 kW Rayox® reactor is used for low flow applications and the Sentinel™ series 24-inch and 48-inch reactors can be used for higher flow applications up to 52 MGD per reactor.

Treatment by ***UV Advanced Oxidation***

1,4-Dioxane has a low molecular weight, is highly soluble in water, and is not readily volatile making more common treatment techniques such as carbon adsorption, air stripping, reverse osmosis or biological treatment unfavorable.

UV light reacts with the oxidants added to the water to form highly reactive hydroxyl radicals. The reaction rate of 1,4-Dioxane with these hydroxyl radicals is high, making UV AOP an effective and affordable option for treatment.

Oxidants:

Hydrogen Peroxide

Hydrogen peroxide is a commonly used chemical oxidant in advanced oxidation processes. It is normally supplied in concentrations of 35% or 50% in water, and is metered into the flow line upstream of the UV lamps.

Chlorine

Chlorine is commonly used for disinfection; however its use in advanced oxidation is relatively new. It is normally supplied as hypochlorite at a concentration of 12% in water, and is metered into the flow line upstream of the UV lamps.