

TROJAN UV[™]

CASE STUDIES

Environmental Contaminant Treatment



Site Example: The Trojan UVPhox™ Applied at a Groundwater Remediation Site for 1,4-Dioxane and VOC Treatment

STOCKTON, California Project

In the early 1990's, the volatile organic compounds (VOCs) tetrachloroethylene (PCE), and trichloroethylene (TCE) were discovered in the vicinity of several city water supply wells near the city of Stockton, California. An aggressive hydraulic containment/water reinjection system was installed to contain the plume and protect the quality of the drinking water. For several years, a treatment system consisting of granular activated carbon and air stripping was used to remove VOCs from the reinjected water.

However, the contaminant 1,4-dioxane was also discovered in the plume. 1,4-Dioxane is commonly used as a stabilizer in chlorinated solvents, and therefore is often present in VOC plumes. In particular, 1,4-dioxane contamination is commonly found at sites contaminated with 1,1,1-trichloroethane (TCA), a solvent that contains up to 15% 1,4-dioxane. A semi-volatile

contaminant with low volatility and low affinity for carbon materials, 1,4-dioxane resists removal from water by carbon or air stripping. The consulting engineer for the project, Dudek and Associates Inc., contacted Trojan Technologies for a treatment solution to remove this emerging contaminant. Trojan worked closely with the engineers to provide an optimized low-energy ultraviolet light (UV) oxidation system to treat the 1,4-dioxane.

THE TROJAN SOLUTION

Trojan provided a pressurized, multi-lamp TrojanUVPhox™ reactor system to treat the 1,4-dioxane by UV-oxidation, a process that combines UV light and hydrogen peroxide. To optimize the UV treatment system during the design phase, Trojan performed testing on groundwater collected at the site to

determine its water quality parameters. The resulting TrojanUVPhox™ system was installed in the summer of 2001 and is still in operation today.

DESIGN PARAMETERS

- **FLOW RATE:** 200 gallons per minute
- **INFLUENT 1,4-DIOXANE CONCENTRATION:** 110 parts per billion (ppb)
- **EFFLUENT 1,4-DIOXANE CONCENTRATION:** < 1.0 ppb
- **OXIDIZER (FOR 1,4-DIOXANE TREATMENT):** Hydrogen Peroxide

CASE STUDIES



TESTIMONIALS

"We are extremely pleased with the performance of the Trojan system. The energy costs are significantly lower than expected and Trojan has continued to work with us to optimize operations as influent concentrations of 1,4-dioxane have changed."

Derek Reed, P.E.

Project Engineer, Dudek and Associates, Inc.

GENERAL CONTAMINANT OVERVIEW

CONTAMINANT:
1,4-Dioxane

POTENTIAL SOURCES:

- Chlorinated solvents manufacturing
- Printed circuit board manufacturing
- Plastic, lacquer, varnish & paint manufacturing
- Dye, resin, wax & grease manufacturing
- Textile processing
- Pesticide production
- Tissue processing & biological labs

TOXICITY:

- Probable human carcinogen

CALIFORNIA DEPARTMENT OF HEALTH SERVICES (DHS):

- Action level - 3.0 parts per trillion (ppt)

SUMMARY:

1,4-Dioxane is most commonly used in industry as a stabilizer in chlorinated solvents such as TCE. Reported fractions of 1,4-dioxane in the host solvent range from 1% to 15%, depending on the manufacturer. For this reason, 1,4-dioxane is often found intermingled in groundwater solvent plumes. Due to its chemical properties, 1,4-dioxane migrates farther and persists longer than other contaminants in a groundwater plume.

BEFORE TREATMENT:

- (1,4-Dioxane) 110 ppb

AFTER TROJAN LOW-ENERGY UV TREATMENT:

- (1,4-Dioxane) <1.0 ppb