



## Aerobic Solvent Bioremediation Case Study: New Jersey Brownfield Site

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### Location

Near Newark, New Jersey

### Site Conditions

Ground water plume in an alluvial aquifer beneath an active facility. High permeability and hydraulics conductivity. Aerobic aquifer conditions.

### Target Chemicals

The target chemicals were TCE, DCE and vinyl chloride. The exposure risk driver was both vapor intrusion and off-property migration.

### Special Considerations

The site remediation was accelerated to meet an aggressive redevelopment plan.

### Application

Three applications of hydrated CL-Out microbes were injected through a grid of injection points.

### Results

After four months all contaminant concentrations were below the remediation goals and the site received a No Further Action letter in less than a year.

### Background

CL-Out® was successfully used to remediate TCE in ground water at a former industrial site near Newark. The affected ground water was perched on siltstone bedrock in a mix of fill and alluvial sand deposits. The cleanup goal was to reduce the contaminant mass sufficiently to meet site-specific goals to prevent vapor intrusion and off-site migration risks.

### Site Specific Conditions

TCE was found in the soil and ground water under a large industrial building. Ground water flow from the source area created a down-gradient plume that covered approximately three acres.

The ground water surface sloped steeply toward a river that formed the down gradient property boundary. The impacted ground water was 5 to 25 feet thick depending on the thickness of the fill and overburden sediments.

The contamination was mainly TCE with some trace concentrations of PCE and breakdown products cis-1,2 DCE and vinyl chloride. The TCE concentrations in ground water were up to 8,400 µg/L. DCE concentrations were above 100 µg/L in two down gradient monitoring wells, but the DCE concentration in most monitoring wells was less than 50 µg/L. Vinyl chloride was detected in the two down gradient wells at up to 50 µg/L, but it was not detected in most monitoring wells.

The geochemistry of the ground water reflected the nature of the aquifer material. The up-gradient two thirds of the ground water plume were in native overburden alluvial sands. The down gradient one third of the ground water passed through a thick fill layer. The aquifer was strongly aerobic in the up gradient part of the plume, but oxygen deficient in the area that passed through the fill.

### Remediation Design

Due to pending development of the site and aggressive remediation was undertaken. Contaminated soil that was accessible for removal was excavated and disposed off site. CL-Out bioremediation was implemented during construction to keep the project on schedule.

CL-Out was injected into the ground water through direct-push injection points set on a 40 foot grid covering the plume. Two drums of CL-Out (110 gallons) were injected into each injection point. Two applications were completed in the down gradient portion of the plume and one treatment has been completed in the up gradient portion.

### Results

After the CL-Out application, TCE concentrations in all monitoring wells decreased significantly. The highest concentration in the source area decreased from 8,400 µg/L to 330 µg/L. In most other areas of the site the post-treatment concentrations were much lower. In all cases vinyl chloride was not produced, which keeps the risk profile as low as possible. After the treatment was completed and two rounds of post-treatment monitoring showed that the cleanup goals were met, NJDEP has