



7421 A Warren Ave. SE
Snoqualmie, WA 98065
Phone: 425.396.4266
Fax: 425.396.5266
dfleming@thermalrs.com

Guaranteed Remediation Certainty Our Word Is Who We Are

Project Example – Full Scale Guaranteed Remediation of Tetrachloroethene using Electrical Resistance Heating, Queens, New York

*This project involved a **guaranteed source area remediation of tetrachloroethene (PCE)** at an operating school bus maintenance facility located in Queens, New York.*

Client Reference: Mr. David Chiusano, project manager, New York State Department of Environmental Conservation, Division of Environmental Remediation, Albany, NY, (518) 402-9813; Mr. Jon Sundquist, URS Corporation, (716) 856-5636.

Engineer: Mr. Greg Beyke, Thermal Remediation Services (TRS) Vice President of Engineering, Franklin, TN, (615) 791-5772, gbeyke@thermalrs.com.

Project Superintendent: Mr. Paul Bianco, TRS project manager, Bend, OR, (541) 318-7079, pbianco@thermalrs.com.

Lithology: Clean sand in both the vadose and saturated zones.

Hydrology: Groundwater depth at 12 ft below grade surface (bgs).

Treatment Area, Depth Interval and Volume: 4,900 square feet, 9 - 55 ft bgs and about 8,350 cubic yards.

Site Constraints: Operations in an operating, highly congested school bus maintenance and storage facility and in a congested area in downtown Queens, NY.

Beginning Contaminant Concentrations: 10,000,000 µg/kg PCE in soil.

Results: Confirmatory soil sample results were non-detect (ND) in 24 of 25 samples for an average **99.9996%** reduction.

Project Status: Confirmatory results have been validated and the NYSDEC is presently preparing the construction certification report for site closure.

Period of Performance: December 2005 - April 2006.

TRS Project Price: \$1,640,000.

Contract Terms: Guaranteed performance based fixed price with bonding.

Background

Thermal Remediation Services, Inc. (TRS) as a subcontractor to Clayton Group Services, provided Electrical Resistance Heating (ERH) design, construction, operations, and specialty equipment for remediation of tetrachloroethane (PCE) in soil and groundwater at the Westside Corporation site in Queens, New York (the Site).

The Site was previously used as a storage and distribution center for dry cleaning supplies including the storage of PCE in above ground storage tanks. Improper handling of the stored chemicals led to a release of PCE that impacted the site soil and groundwater. The site is presently used as an operating school bus terminal for dispatching, repairing and

maintaining school buses. The area that surrounds the site is mixed commercial and residential.

A chemical oxidation pilot test did not work that was conducted prior to ERH.

The ERH treatment area was 4,900 square feet with a remediation depth interval from 9 - 55 ft bgs. The resulting treatment volume was approximately 8,350 cubic yards. The initial maximum concentration of PCE in soil was 10,000,000 $\mu\text{g}/\text{kg}$. This was a PCE source removal action.

The beginning average concentration of PCE in soil was 1,056,000 $\mu\text{g}/\text{kg}$. The PCE average was calculated using 23 soil samples collected from subsurface intervals ranging from eight to 41 ft bgs at eight sample locations from the combined 1999 and 2001 sampling events.

Construction and Operations

The ERH system included 32 electrodes and co-located vapor recovery wells and 13 Temperature Monitoring Points (TMPs) with thermocouples at five-foot subsurface intervals. The ERH specialty equipment from the TRS fleet included two custom-manufactured 500-kW Power Control Units (PCUs) for continuous power delivery to the treatment volume, two 40-horsepower blowers and one condenser. Catalytic oxidation was used for vapor treatment per project requirements. Granular Activated Carbon (GAC) would have sufficed at lower cost.



Figure 1. Site Layout

The remedial goals for this project were based on maintaining subsurface temperatures, maintaining a daily rate of power input, and operating the ERH remediation system for a number of days.

ERH operations began at the end of December 2005 and were completed in the middle of April 2006. Figure 2 illustrates the VOC vapor recovery rate in pounds (lbs) per day and the total VOC cumulative mass recovered over time. The peak recovery rate of 900 lbs per day occurred about one month after ERH operations started. The cumulative mass of VOCs recovered was approximately 3,750 lbs.

ERH VAPOR RECOVERY

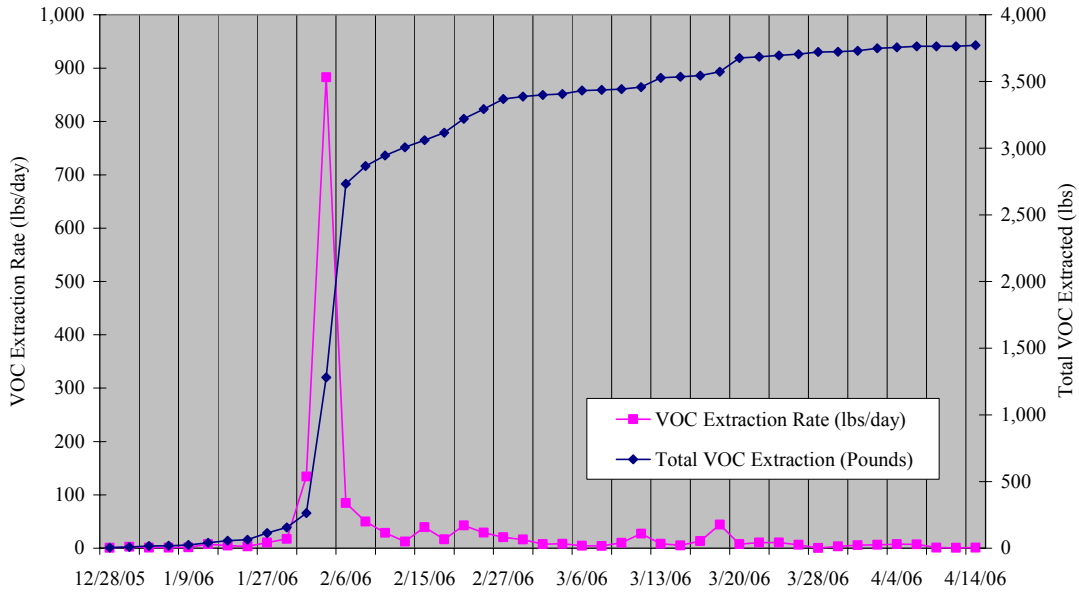


Figure 2. ERH Vapor Recovery

Results

The ERH remediation was a big success achieving final PCE concentrations in soil well below what was expected. Four months of ERH operations achieved non-detect (ND) in 24 of 25 samples for an average **99.9996%** reduction in PCE concentrations in soil.

Twenty-five confirmatory soil samples were collected from eight locations inside the remediation area at the following subsurface intervals; 14-18 ft bgs, 28-30 ft bgs, and 38-42 ft bgs. One sample location also included the interval from 51-55 ft bgs. All but one of the soil samples were ND for PCE. The PCE concentration in soil at sample location PR-2 collected at 38-42 ft bgs was 10 $\mu\text{g}/\text{kg}$ (“J” value, estimated concentration). The detection limit for PCE was 4.2 $\mu\text{g}/\text{kg}$. See Figure 3 Confirmatory Sample Results Before and After ERH.

The confirmatory results have been validated and the NYSDEC is presently preparing the construction certification report for site closure.

The cost for utility services and electricity in New York are higher than the national average. More sampling was required than typical, which also increased the cost of the project.