



# CASE STUDY

**SITE: PRODUCTION FACILITY, BOONE, IOWA**

**CLIENT: GATES RUBBER COMPANY**

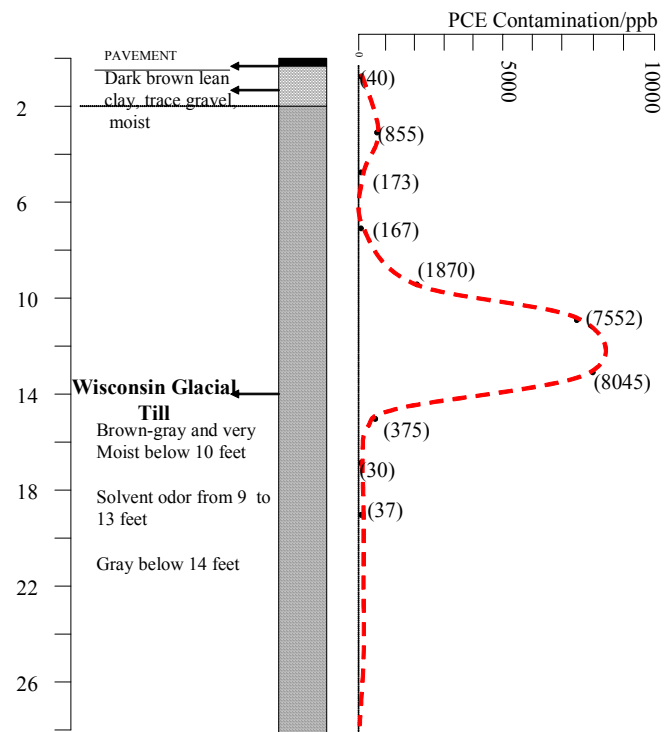
## INTRODUCTION

Following the completion of a Phase II ESA in 1999 at the Gates production facility in Iowa, LTE personnel determined that soil (glacial till) and groundwater had been contaminated by a release of perchloroethene (PCE). Byproducts of PCE were also present in groundwater and included trichloroethene (TCE), cis-1,2-dichloroethane (cis-1,2-DCE), and vinyl chloride (VC). Contaminants of concern (COC) concentrations in groundwater ranged up to 400 milligram per liter (mg/L), and the contamination extended offsite. An Environmental Protection Agency (EPA) Consent Order was issued requiring a complete RCRA Facility Investigation/Corrective Measures Study/Corrective Measures Implementation (RFI/CMS/CMI) within set timeframe. At Gate’s request, LTE personnel worked closely with the EPA to obtain approval to “fast-track” the process. Fast-tracking included being allowed to conduct a full-scale remedial action as an interim measure immediately following a pilot test of the approved corrective action.

## EVALUATION

In order to have a complete understanding of the plume, an extensive site characterization was conducted to define the impacted horizons. Based on the data, a risk analysis, including fate and transport modeling, exposure pathway identification and evaluation, and a toxicity assessment were performed in order to prepare the RFI report and to develop potentially applicable technologies. Pilot studies demonstrated that potassium permanganate to knock down the highest concentrations and reactive-iron for a more long term treatment would be effective measures for removing the chlorinated solvents.

**Production Facility - Boone, IA  
ST-1 - Soil Boring Log and Test Data**





In 2007, the EPA requested that additional work be performed to evaluate relatively-high concentrations of PCE and byproducts TCE, cis-1,2-DCE and VC identified in October 2006 in the underling deeper aquifer. The byproducts are likely the result of reductive dechlorination by reactive-iron injected in 2001. The reactive-iron treatment was targeted at impacts limited to the shallow, unconfined, supraglacial-till aquifer. The deeper, confined, subglacial-till aquifer had not been significantly impacted, prior to these COCs having been observed in October 2006.

Based on the recently identified COCs in the deeper confined aquifer and a desire on Gate's part to complete the remedial action quickly, LTE has initiated a **TerraCert™** program use a newly developed carbon-based injectate in the original source area and in the deeper confined aquifer. The objective is to control the distribution of the daughter products generated from the incomplete dechlorination of the PCE during the interim reactive-iron injection program.

## DESIGN / INSTALLATION

In 2001, LTE selected an *in situ* treatment using potassium permanganate followed by secondary long-term treatment using reactive-iron to implement the interim measure corrective action. Injection points were tightly spaced using a grid pattern. Moderate injection pressures were used to fracture the subsurface materials allowing for more widespread vertical and horizontal distribution of the injectates. The injection process, coupled with the close grid pattern, resulted in a lace-like network of injectate throughout the shallow aquifer. By 2006 the concentrations of PCE in the source areas had stabilized and daughter products were observed.

In 2007, LTE is conducting pilot studies using the carbon-based injectate BOS 100® which combines nano-scaled reactive-iron with carbon to trap and treat PCE and any daughter products generated before they can migrate beyond the treatment zone.

## RESULTS

Per the Consent Order requirements, quarterly groundwater monitoring and reporting continue by LTE with initial observed reductions in concentrations that average 95% to 98% throughout the site and limited rebound in select source areas with the permanganate and reactive-iron treatment.

As a result of the desire to decrease the overall life cycle and therefore costs for of the site, a full scale **TerraCert™** injection program using a carbon based injectate is scheduled to be completed in the fall of 2007 with anticipated closure to be achieved by fall 2008.