

## **Steam Remediation of Chlorinated Solvent Sources**

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Two sites with chlorinated solvent contamination are locations for ongoing work utilizing steam remediation technologies. The sites provide an interesting opportunity to compare and contrast steam remediation technologies in context of the same general goal: to remove a chlorinated solvent source from a specified target region. The two sites are locations of ongoing work by Integrated Water Resources, Inc. and IT Corporation, with projects to remove PCE and TCE at Savannah River Site, South Carolina, and to remove TCE from a source zone at Cape Canaveral, Florida. At the Savannah River Site project, IWR is deploying steam remediation technologies developed at Lawrence Livermore National Laboratory, including: (1) Dynamic Underground Stripping – Engineered combination of steam injection and vapor and groundwater extraction; (2) Hydrous Pyrolysis/Oxidation (HPO) — Destruction of underground contaminants through oxidation in the presence of injected steam; and (3) Electrical Resistance Tomography (ERT) – Geophysical imaging technique for tracking subsurface thermal changes during DUS/HPO operations. The technologies are being used to extract PCE and TCE (principally PCE) from the subsurface, where 13,000 kg of solvent is estimated to exist in the target zone. Target zone sediments extend to 160 below ground surface and are both saturated and unsaturated. After the first 4 months of operations, most of the target zone is at the boiling point for PCE, with increasing mass removal rates and over 2 tons of PCE and TCE recovered to date. At Cape Canaveral, IWR is the project lead for the final technology deployment of the Interagency DNAPL Consortium's (IDC) technology comparison test at Launch Complex 34. Because of a very thin vadose zone and relationships between stratigraphy and NAPL distribution, IWR's application of steam remediation technologies at Cape Canaveral includes the use of co-air injection during initial phases of work, as a means of mobilizing TCE in vapor phase ahead of the active steam heating zone. This site is somewhat smaller but exists within a larger source; the estimated mass of TCE for steam remediation removal here also is approximately 13,000 kg. Comparison of steam remediation technology deployment at the two sites includes: site conditions, manner of technology selection, design of subsurface facilities and surface treatment system, operations, monitoring techniques; and performance goals and analysis.