Use of Cometabolic Air Sparging to Remediate Chloroethene-Contaminated Groundwater

A successful way to treat chlorinated solvent-contaminated groundwater
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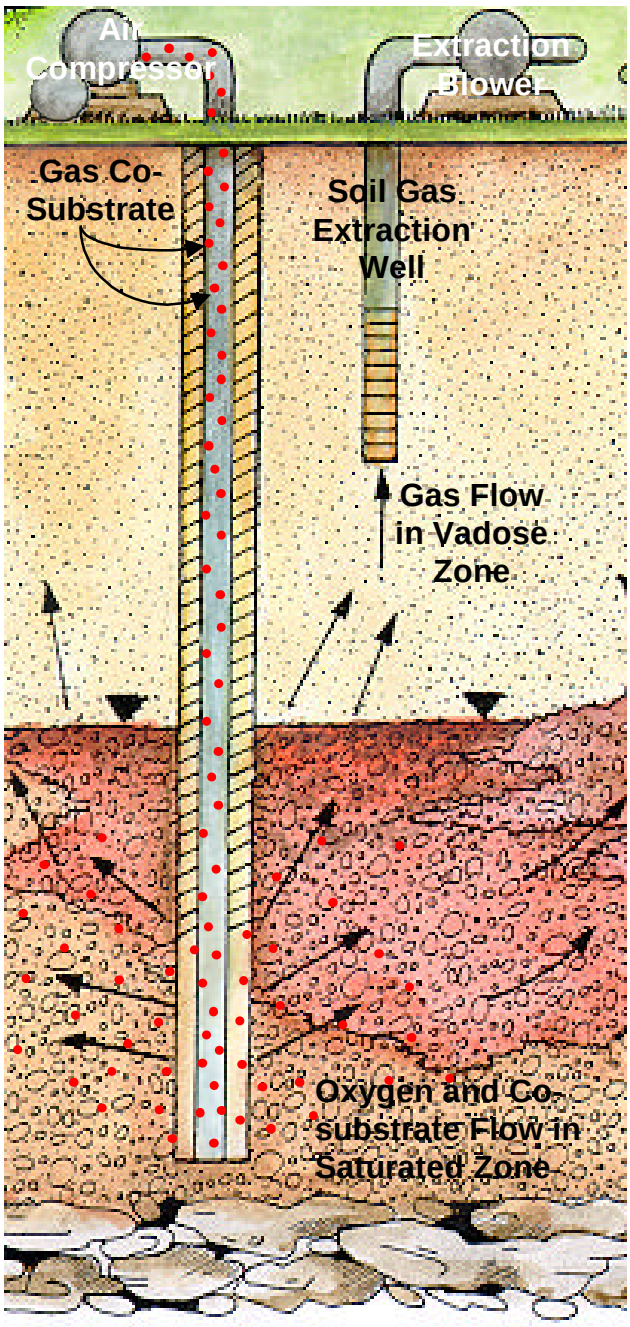
PURPOSE

Chlorinated aliphatic hydrocarbons (CAHs) comprise some of the most common groundwater contaminants. The Air Force alone has over 630 sites contaminated with chlorinated solvents which may require cleanup. In situ remediation technologies with inexpensive installation costs and low operation and maintenance requirements are needed. Air sparging coupled with cometabolic biodegradation of CAH contaminants has the potential to satisfy these requirements. Validation of this technology in a full-scale field demonstration will provide design and cost information transferable to other sites.



DESCRIPTION

This effort is directed towards the in situ aerobic cometabolism of trichloroethene (TCE) or mixtures of CAHs. McClellan AFB, California, has been selected as the first site for the cometabolic air sparging demonstration. McClellan AFB has significant CAH groundwater contamination, including TCE-only- and mixed-CAH-contaminated sites. Ongoing studies have demonstrated that indigenous bacteria at McClellan AFB can utilize propane as a cosubstrate for cometabolic CAH degradation.

Cometabolic air sparging will be demonstrated using two air injection wells, one with and one without a cosubstrate. The cosubstrate will be introduced into the injected air stream above ground. Injection wells will be situated for maximum CAH stripping from the groundwater and degradation of the contaminants. Multiple monitoring points will surround the air-injection wells. Data will be collected to determine: air sparging radius of influence; subsurface air and propane distribution; cosubstrate degradation; O_2 uptake; cosubstrate usage efficiency; relative contributions of contaminant stripping versus cometabolic biodegradation; ability to degrade different CAH compounds and the long-term stability of the cometabolic biological process.

The two test locations included in this effort will be conducted over two 4-month periods. For the first test location, a site with only one contaminant will be selected. The second test location will be conducted based on experience and data gained from this first test. A site with multiple contaminants will be selected, and multiple cosubstrates, if necessary, will be used to promote cometabolic degradation. Changes in microbiology before and after the air sparging tests at both sites will be examined by performing soil microcosm studies.

BENEFITS

Cometabolic air sparging systems are expected to be significantly lower in cost and duration than comparable pump-and-treat systems. This work will provide cost information to be used for full-scale design and implementation and for comparison with other potential cleanup processes.

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