

## **Drive-Point Injection System for In-Situ DNAPL Remediation**

### **Description and application**

Traditionally, soil formations contaminated by dense non-aqueous phase liquids (DNAPL) have been treated by flushing the contaminated zone with oxidants, such as hydrogen peroxide or potassium permanganate. Flushing involves using mechanical pumps to inject the oxidants up-gradient of the contaminated zone and to draw off displaced water down-gradient, thereby leaving the oxidants in-situ to destroy the DNAPL contamination.

Aside from relying on costly pumping equipment and the necessity of nearby electrical service, this technique is somewhat turbulent and increases the chances of spreading DNAPL contamination in both lateral and horizontal directions, thereby potentially increasing the overall footprint of the contaminated zone.

To reduce overall remediation cost and to overcome the current disruptive disadvantages of flushing techniques, the University of Waterloo has developed a passive non-mechanical system for injecting oxidants into contaminated soil formations for the purpose of remediating DNAPL. The system relies on pressure injection of potassium permanganate oxidant down a hollow drive-point tool, fitted with approximately 3 inches of well screen above the tip. The drive-point is positioned at a depth above the DNAPL contamination so that the dense permanganate solution can migrate laterally and horizontally downward into the contamination zone.

As DNAPL is very immiscible in water, typically the DNAPL contamination is found in pockets or elliptical lenses in the soil formation. In order to effectively cover a range of depths where disparate zones of DNAPL may be located, the drive-point tool can easily accommodate serial injections at various depths down a single borehole. The system relies on gas (i.e. nitrogen) pressure injection and thus requires no pumps or electricity and thus offers cost effective, passive, and non-disruptive treatment of DNAPL contamination.

### **Stage of development**

The in-situ DNAPL treatment system has been successfully field tested at the Canadian Forces Base Borden groundwater test aquifer location.

### **Reference**

8810-7178

### **Patent status**

U.S. Patent # 6,274,048 has been issued. The technology is available for licensing

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