

Ground Water, Surface Water, and Leachate

Passive/Reactive Treatment Walls

Introduction/Description:

These barriers permit the passage of water whilst triggering the degradation or removal of contaminants. A permeable reactive wall is installed across the flow path of a contaminant plume, enabling the water fraction of the plume to passively move through the wall. These barriers prohibit the movement of contaminants by making use of agents as zero-valent metals, chelators (ligands selected for their specificity for a given metal), sorbents and microbes.

Contaminants will either be degraded or retained in a concentrated form by the barrier material, and could provide permanent containment for moderately benign residues or offer a decreased volume of the more toxic contaminants for later treatment.

Funnel and Gate:

Adaptations to basic passive treatment walls may entail a funnel-and-gate system or an iron treatment wall. The funnel-and-gate system for *in situ* treatment of contaminant plumes involves a low hydraulic conductivity cut-off wall (the funnel) with a gate that includes *in situ* reaction zones, whilst the ground water flows through the high conductivity gaps (the gates). The type of cut-off walls liable to be used in the present practice is slurry walls or sheet piles.

Iron Treatment Wall:

An iron treatment wall is composed of iron granules or other iron bearing minerals for the treatment of chlorinated contaminants such as TCE, DCE, and VC. As the iron is oxidised, a chlorine atom is removed from the compound by reductive dechlorination, using electrons supplied by the oxidation of iron. The process dissolves the iron granules, but the metal disappears so slowly that the remediation barriers can be expected to stay effective for numerous years, perhaps even decades.

Passive treatment walls are intended for long-term operation to prevent the migration of contaminants in ground water.

Applicability:

VOCs, SVOCs, and inorganics are suitable for treatment walls. The technology can also be used for treating some fuel hydrocarbons, although at a reduced efficiency.

Limitations:

- Passive treatment walls may lose their reactive capacity, requiring replacement of the reactive medium.
- Passive treatment wall permeability may decrease due to precipitation of metal salts.
- Depth and width of barrier.
- Limited to a subsurface lithology that has a continuous aquitard at a depth that is within the vertical limits of trenching equipment.
- Volume cost of treatment medium.
- Biological activity or chemical precipitation may limit the permeability of the passive treatment wall.

Data Needs:

Hydraulic gradient, contaminant characteristics (depth, area extent, type, and concentration), depth to ground water, site stratigraphy, ground water hydrology such as water quality, flow rate, and direction, soil permeability and buffering capacity.

Performance Data:

A number of treatment walls have been set up for undertaking the remediation of ground water contaminated with chlorinated aliphatic hydrocarbons.

Cost:

The amount of material being treated and the width of the plume to be treated can have a large impact.

Choice of supplemental amendments.

Monitoring requirements that may be desired by regulators.