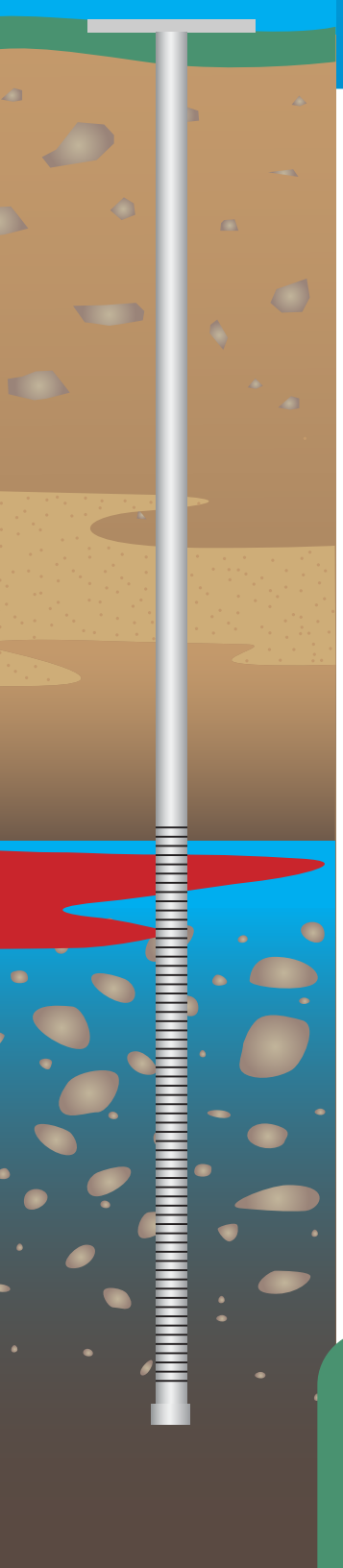


pH BUFFERING

SITE LOGIC

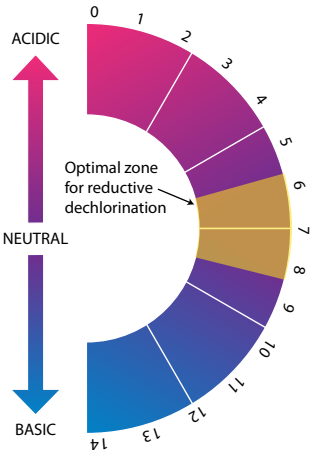
Acidity testing — Avoid pH complications before they happen

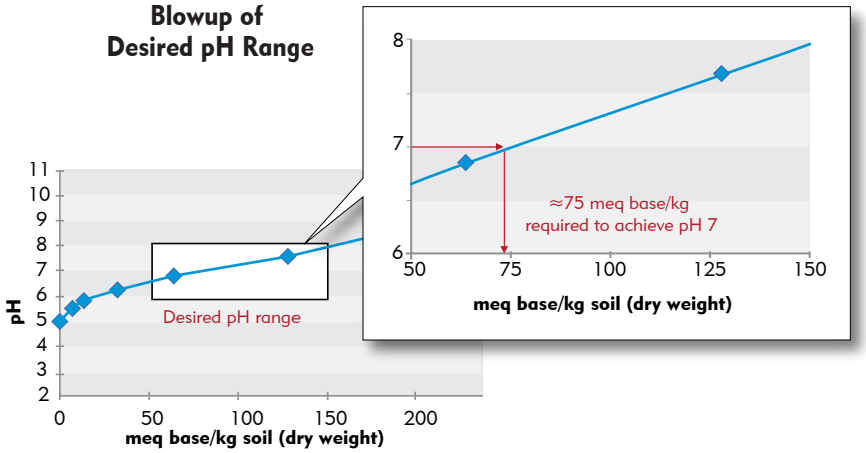
Every organism has a pH range within which growth is possible and typically a well-defined optimum pH for maximum growth rates and activity. Although organisms that thrive in low pH (acidophiles) and high pH (alkaliphiles) environments have been isolated, most microorganisms are classified as neutrophiles with pH optimums between pH 6 and 8. Many important bacterial groups responsible for biodegradation of chlorinated solvents belong to this neutrophile category. For example, the pH for optimal growth of *Dehalococcoides*, the only known bacterium capable of complete reductive dechlorination of PCE to ethene, is between pH 6.8 and 7.5 [1]. Likewise, optimal pH ranges for several *Desulfitobacterium* species capable of reductive dechlorination of chlorinated ethenes and ethanes are near neutral [2] [3]. Thus maintenance of a circum neutral pH in subsurface environments can be an important factor in promoting reductive dechlorination.

In pristine aquifer systems, low groundwater pH is relatively uncommon. More often, pH excursions are a direct result of site activities including:

- co-contamination with strong acids,
- in situ chemical oxidation, and
- organic acid production following subsurface injection of an electron donor.

Aquifer pH can be increased by the circulation or injection of a dissolved base or alkaline material. The added alkalinity, however, will be consumed by groundwater acidity and acidic mineral surfaces. The acidity and buffering analysis provides the equivalents of base needed to overcome aquifer acidity and maintain a near neutral pH required for optimum biological activity.





In the case study shown, the current subsurface pH is 5.1 which is well below the optimum range for *Dehalococcoides* suggesting possible inhibition of reductive dechlorination. Based on acidity testing, 75 mequivalents base/kg soil would be necessary to consume acidity and achieve a pH of 7. Armed with this acidity value, the base equivalents of the chosen alkaline material (provided by manufacturer or vendor), and the size of the treatment zone, site managers can then calculate the mass of alkaline material required and injection parameters.

References Cited

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2. Gerritse et al. 1999. Appl. Environ. Microbiol. 65(12): 5212-5221.

3. Suyama et al. 2001. Biosci. Biotechnol. Biochem. 65(7): 1474-1481.

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