Combining ISCR and Antimethanogenic Reagents to Achieve Substantial CVOC Reductions

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Background/Objectives. Methanogens often become the dominant microbes in reducing environments due to their population doubling times and are the only known microorganisms capable of producing methane. The microbial consumption of organic carbon and common electron donors used in the remediation of chlorinated solvent sites will resultin the fermentation of various byproducts and end-products, including the potential for excess methane production. Excess methane gas yields at least three potential consequences during in situ remediation.

Approach/Activities.
Efficiency/Cost - Methane is a waste product in the consumption of the selected remedial reagent, as it represents hydrogen that is not directly benefitting the dechlorination reactions.
Safety - Elevated methane concentrations can exceed current and pending regulations in groundwater and methane gas can induce vapor migration issues, potentially causing indoor air issues of chlorinated VOCs.

Results/Lessons Learned.
Performance – Rapid growth of methanogens consume alkalinity while generating acids, increasing the potential for aquifer acidification. Combining antimethanogenic reagents (AMRs) with conventional remedial technologies allows for more rapid reductions in chlorinated volatile organic compounds (CVOCs) and more efficient use of the amendments due to restriction of methanogen population growth, thereby reducing safety hazards associated with excess methane. The addition of AMRs to solid in situ chemical reduction (ISCR) amendments (e.g., organic donor plus zero valent iron), has been shown to suppress methanogen populations while allowing other microbial species (e.g., *Dehalococcoides*) to flourish, thus creating more rapid reductions of CVOC concentrations and predictable changes in geochemistry without excessmethane production. Pre- and post-application data will be presented from various field-scale applications, showing reductions in CVOCs, as well as predictable changes in geochemistry data, showcasing the avoidance of the three potential consequences of excess methane production.