

Tightening Up Vadose Zone Gas Phase Characterization and Monitoring

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Sampling and analysis of soil gas collected from wells has had a perilous history as a technique for characterizing vadose zone contamination. Although ostensibly simple to collect, measurements of gas phase contamination are rarely relied upon because of common troubles with concentration variability in wells. The variability is justifiably, not well-understood in light of a common but incorrect conceptual model of homogeneous, diffusion of volatile compounds from well defined sources in the vadose zone and accurate sampling of ambient concentrations using vadose zone wells. Much of the inconsistency can be resolved and often eliminated, however, if a correct conceptual model of contamination and gas transport in the vadose zone is employed in collecting and evaluating gas phase data. A conceptual model of vadose zone contamination and transport factors will be discussed including the relation of advection and diffusion in heterogeneous geology, and surface/subsurface interactions (e.g., barometric pumping effects through sampling wells). Tools for accurately collecting and interpreting gas phase data will also be presented in examples of actual field characterization activities and experiments. The examples will include sites contaminated with volatile organic contaminants and tritium.