Field Analysis of LNAPL Flux Using Well Bore Dilution Techniques

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Abstract. ChevronTexaco and Colorado State University have developed a tool that provides direct measurements of *in situ* LNAPL flow through wells. LNAPL flow is determined by 1) introducing a fluorescing tracer to LNAPL and 2) tracking the tracer concentration over time. The rate of tracer disappearance provides a direct measure of rate of LNAPL flow through the well (e.g. liters of LNAPL through a well/year).

Coupling the LNAPL flow rate with the gradient of the local LNAPL table, estimates of LNAPL flux and formation transmissivity to LNAPL are developed. LNAPL flux addresses the direction and magnitude of LNAPL movement. The magnitude of the flux is a discharge per unit cross-sectional area of LNAPL perpendicular to flow (volume/time/area). This simplifies to units of length per time (e.g. ft/day) and is referred to as a Darcy velocity. Transmissivity to LNAPL (units of length^2/time) characterizes the capacity of the formation to transmit LNAPL. This is the primary input needed to resolve the feasibility of LNAPL depletion via pumping.

Field flux measurements from ChevronTexaco's Casper Refinery provide two useful insights. First, the magnitudes of the observed LNAPL fluxes are small (0.03 to 2.0 ft/yr). Second, the directions of LNAPL movement are largely inward, toward the interior of the LNAPL body. This suggests that movement of LNAPL at the site is more a matter of slow internal redistribution than lateral expansion and/or translation.

Further LNAPL flux studies are now in progress with support from Suncor Energy and the American Petroleum Institute. These include improvements to the flux meter, comparisons of baildown test and seepage meter estimates of transmissivity to LNAPL, and field studies characterizing seasonal variation in LNAPL flux at Suncor's Denver Refinery. The overarching objective of this research is developing a better understanding of the processes inherent in LNAPL mobility.

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