

Assessing Impacts to Groundwater from CO₂-flooding of SACROC and Claytonville Oil Fields in West Texas

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Abstract

Comparison of groundwater above two Permian Basin oil fields (SACROC Unit and Claytonville Field) near Snyder, Texas should allow us to assess potential impacts of 30 years of CO₂-injection. CO₂-flooding for enhanced oil recovery (EOR) has been active at SACROC in Scurry County since 1972. Approximately 13.5 million tons per year (MtCO₂/yr) are injected with withdrawal/recycling amounting to ~7MtCO₂/yr. It is estimated that the site has accumulated more than 55MtCO₂; however, no rigorous investigation of overlying groundwater has demonstrated that CO₂ is trapped in the subsurface. Mineralogy of reservoir rocks at the Claytonville field in southwestern Fisher County is similar to SACROC. CO₂-EOR is scheduled to begin at Claytonville Field in Fisher County in early 2007. Here we have the opportunity to characterize groundwater prior to CO₂-injection and establish baseline conditions at Claytonville.

Methods of this study will include: (1) examination of existing analyses of saline to fresh water samples collected within an eight-county area encompassing SACROC and Claytonville, (2) additional groundwater sampling for analysis of general chemistry plus field-measured pH, alkalinity, and temperature, stable isotopic ratios of hydrogen (D/H), oxygen (¹⁸O/¹⁶O), and carbon (¹³C/¹²C), and (3) geochemical equilibrium and flowpath modeling. Existing groundwater data are available from previous BEG studies, Texas Water Development Board, Kinder Morgan CO₂ Company, and the U. S. Geological Survey. By examining these data we will identify regional groundwater variability and focus additional sampling efforts. The objective of this study is to look for potential impacts to shallow groundwater from deep CO₂-injection. In the absence of conduit flow from depth, we don't expect to see impacts to shallow groundwater, but methodology to demonstrate this to regulators needs to be established.

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Biographical Sketches

Rebecca C. Smyth holds an M. A. in geology (specialty in hydrogeology) from University of Texas at Austin and is a registered professional geologist in the State of Texas. Over the past 10 years at BEG her work has included groundwater impact studies related to oil and gas exploration and production throughout Texas and elevated levels of arsenic in south Texas.

Mark H. Holtz has more than 20 years of reservoir characterization experience at the BEG. He has focused on integration of geology and engineering in both carbonate and siliciclastic oil and gas reservoirs throughout the *U.S. Gulf Coast, the Australian Cooper and Eromanga Basins, the Vienna Basin, Venezuela, Argentina, and Mexico.*

Stephen N. Guillot is Senior Reservoir Engineer for Kinder Morgan CO₂ Co. LP. He is managing Kinder Morgan's industry support of Southwest Regional Partnership for Carbon Sequestration research studies at the SACROC Unit and Claytonville Field east of Snyder, Texas.