

Relationships between Geologic Zones, Produced Water, Saltwater Management, and Seismicity in Oklahoma

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Abstract

Management of produced fluids has become an important issue in Oklahoma because large volumes of saltwater are co-produced with oil and gas, and subsequently disposed into saltwater disposal (SWD) wells. Statewide (excluding Osage County) SWD volumes ranged from 800 to more than 1266 MMbbl from 2009–2014, and steadily increased at rates that mimic petroleum production from the Mississippian and Woodford zones. Much of the increase in production has occurred in central and north-central Oklahoma because of development in the Cherokee Platform and Anadarko Shelf geologic provinces. The Arbuckle Group is the main disposal zone in these geologic provinces for a number of reasons including that it is highly permeable, has a capacity to accept waste fluids, underlies the producing zones, but yet is sufficiently shallow to make completion of a SWD wells relatively inexpensive. Research indicates that earthquakes can be triggered by fluid injection near strike-slip faults that are oriented in the same manner as regional stresses, especially when high-volume SWDs are completed in basal sedimentary strata (such as the Arbuckle). Because of the confluence of these desirable conditions and confounding challenges, it is critical to investigate the physical and chemical properties of geologic materials that store and produce fluids, and to understand how regional geologic conditions affect fluid production and injection. Water and energy resources are important to the state and the nation, so best management practices must be developed to minimize co-produced water volumes and to handle the co-produced saltwater while minimizing deleterious effects.