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The West Texas (Permian) Super Basin: Prototype and Analog

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ABSTRACT

The West Texas Basin has produced 63 BBOE. Reserves are twice historical production. The basin has been the driver of production growth in the United States and is an excellent analog for other basins.

The basin is built on varied Proterozoic crust. After Cambrian rifting, regional subsidence began in the Ordovician forming the Tobosa Basin. Tobosa Basin subsidence terminated during Mississippian. That tectonic and structural development, controlled by basement terrains, earlier tectonic and structure were reactivated by the Ancestral Rocky Mountain (ARM) and Marathon/Ouachita orogenies. Periodic subsidence during the Mesozoic caused deformation and Cenozoic uplift tilted the basin to the east. Each of these events has a significant influence on the petroleum systems.

The basin has multiple petroleum systems. During early Paleozoic, Simpson Group and Woodford source rocks were deposited. During the transitional basin development, Barnett source rocks were deposited, and during Permian Basin subsidence, the Wolfcamp and middle Permian source rocks were deposited.

Leonardian and Guadalupian reservoirs have produced 71% of the hydrocarbons from conventional reservoirs. These are most abundant on the shelf-crest where reservoir development was maximized and became the focus for migration from the deeper Delaware and Midland basins and shallower, more-proximal shelf source rock systems. Unconventional resource reservoir oil production in the West Texas Super Basin accounted for just under 90% of total basin production at the close of the last decade.

The West Texas Basin production has benefited from an extensive infrastructure, prominent geologic and engineering community, regulatory and public support, open access, sufficient capital, and a scalable service industry. The paradigm toward new drilling, completion, and production technology is driven by unconventional resource reservoir development. These West Texas Basin technological developments have lead industry technolo-

gy worldwide. Maintaining talented human and capital resources are challenges that will determine if society will develop these resources.