ably channel deposits. The lower part is composed of thinner beds about 1 ft (0.3 m) thick of more complete sequences which include ripple laminae. These sandstones represent turbidites of the ABCE type and were probably overbank deposits. Some adjacent sandy shales are moderately bioturbated, generally on a fine scale.

The Technik nonreservoir facies is 31 ft (9.5 m) thick in a core from the Harkin-Five Resources 1 Cyrus Paul well. The section consists of thinly interbedded shales and turbidite sandstones which are typically incomplete sequences of the AE, BE, and CE types. The shales are not bioturbated. The nonreservoir facies may be characterized as "distal" overbank deposits. The nonreservoir facies of the overlying Kubena zone is similar.

The reservoir sandstones are fine grained (0.17 mm) and contain 59% quartz, 12% other mineral grains, 14% matrix, and 15% kerogenlike organic material. Silica overgrowths and calcite cements comprise an average 13% of bulk volume. Composition results in a relatively low average permeability of 4 md and porosity of 18%.

The Technik reservoir sandstone appears to represent the fill of outer-shelf channels along which sands were transported to the shelf margin and into the deeper basin beyond. The nonreservoir facies represents overbank deposits adjacent to channels, but the relation between channel and overbank deposits is not clear. The overbank deposits could have been either contemporaneous, levee sediments adjacent to channel-fill sandstones, or they may represent deposits into which later channels were eroded and then filled.

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Characteristics of Lower Vicksburg Reservoirs, McAllen Ranch Field, Hidalgo County, Texas

Lower Vicksburg sandstones in the McAllen Ranch field, Hidalgo County, Texas, form multiple reservoirs for natural gas at depths that range from 9,300 to 15,400 ft (2,790 to 4,620 m). Core examination shows that the sandstones display ordered sequences of sedimentary structures within beds that average about 4 ft (1.2 m) in thickness. Thicker sandstones are massive below and horizontally laminated above and represent turbidites of the AB type which are probably of channel origin. Thinner sandstones are dominated by laminated and rippled beds that represent turbidites of the BCD type which are probably of overbank origin. Reservoir sandstones appear to represent channel deposits that were closely bounded by levee sediments. Isopach maps show that the sandstones are narrow, linear bodies which have dip trends in the upper part of the section. *However, deeper sandstones in the east part of the field* show an anomalous strike trend.

Average grain size of the sandstones is 0.13 mm (fine grained), and bed sets typically show textural gradation. Average detrital composition is 16% monocrystalline quartz, 35% feldspar, 39% rock fragments, 9% matrix, and 1% other grains. Total cement, mostly calcite, averages 36% of bulk volume. Porosities range from 7 to 24% and permeabilities from less than 0.1 to 118 md. Higher permeabilities are found in thicker channel turbidites.

Structure within the field appears to be dominated by a deep-seated shale uplift which caused the formation of a major growth fault. The normal fault has about 600 ft (183 m) of throw on the downdip side of the shale uplift, but fault-plane dip decreases with depth and becomes essentially parallel with bedding. Below the fault, the Jackson Shale is abnormally pressured and probably folded. Early shale uplift controlled sand distribution by diverting turbidity flows from their normal dip trends. Continued uplift caused slump faulting on the basinward flank, and the fault shows continuous growth with increased thicknesses of lower Vicksburg intervals on the downthrown side. Shale uplift soon ended because trends of later sandstones in the lower Vicksburg are not greatly affected. However, the major growth fault was active through the end of lower Vicksburg deposition. This pattern of early shale uplift and subsequent growth faulting contrasts with previous ideas that attribute shale uplift and faulting to rapid deposition of overlying sediment.

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Subsurface Stratigraphy of Midway-Wilcox, Zapata County, Texas

A subsurface study of the Midway-Wilcox (Paleocene-Eocene) in Zapata County, south Texas, led to the recognition of several stratigraphic units of possible formation rank within the Wilcox section. These units, which together with the Midway may reach a thickness of 15,000 ft (4,570 m) in extreme eastern Zapata County, were established mainly on the basis of depositional patterns as reflected on electric well logs. Four Wilcox units have been identified and named, in ascending order, the Lopeno, Volpe, Vela, and Hinnant. Although gas-bearing sandstones are present in all four units, the more important ones are in the Hinnant and Volpe. Deposition of the Midway-Wilcox appears to have been closely controlled by synchronous structural activity initiated in connection with the formation of the Tertiary Rio Grande embayment. This structural activity caused extensive faulting and great variations in sedimentary thicknesses, and is also responsible for the formation of local and regional unconformities in the study area.

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Upper Mississippian Deltas in Black Warrior Basin of Mississippi and Alabama

Terrigenous clastic and carbonate depositional systems comprising the lower two-thirds of the Chester Series were laid down on the shallow northern shelf of the Black Warrior foreland basin. The evaluated section involves the rock units between the Tuscumbia Limestone and the "*Millerella*" limestone tongue of the Bangor formation. Three significant cycles of deltaic progradation have been identified in northeastern Mississippi