bounded by a fault downthrown to the north. This fault converges eastward with a major east-west trending fault downthrown to the south. The two faults form a graben which terminates to the east by the convergence of the faults and is open to the west. Within the basin the primary geopressured-geothermal aquifer is the *Miogypsinoides* sand of the *Camerina* zone (upper Frio Formation of Oligocene-Miocene age). Within the graben, sediments dip northwest into the basin with dip angles as high as 20°. The first *Miogypsinoides* microfossil was picked at 14,970 ft (4,563 m) and the first good sand occurred at 15,065 ft (4,592 m). The sequence is 640 ft (195 m) thick (15,000 to 15,640 ft, 4,572 to 4,767 m), with 250 ft (75 m) of net sand. There are seven potentially productive sands within the sequence. Four diamond cores were taken. Data from Core 3, 15,389 to 15,405 ft (4,690 to 4,695 m) indicated the sands are medium to fine-grained, with 1 to 2% silt-sized material. Median grain size is 0.26 mm. Thin sections parallel and perpendicular to the core axis show the grains to be angular to subangular. X-ray analysis showed 75% quartz, 19% feldspar, 4% illite, 2% mixed-layer clay (illite/smectite), and a trace of kaolinite. SEM photographs showed cement as quartz overgrowths and clay as very fine hairs in the pore spaces. Porosity is 24% and permeability 3,600 md in Core 3, the fifth sand in sequence. Initial reservoir pressure in this perforated zone (15,387 to 15,414 ft, 4,690 to 4,698 m) was 12,060 psi (83,154 kPa). Temperature at the middle point in the sand was 299°F (148°C). The calculated SP salinity for the well was 50,000 to 70,000 ppm. If Rw/2 is used instead of Rw, the calculated salinities increase to 125,000 to 140,000 ppm.

Reservoir testing included drawdown and buildup tests. The well flowed a total of 240 days. Flow rates varied from 1,000 bbl/day to 34,000 bbl/day. Average surface pressure during the testing is 2,500 psi (17,238 kPa). The gas to water ratio is 25 to 28 SCF/B, of which 20 SCF/B are recovered. Additional testing of the reservoir is planned.

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Growth Faults and Salt Tectonics in Houston Diapir Province—Relative Timing and Exploration Significance

Oil and gas accumulation in Gulf Coast Tertiary strata is controlled mainly by regional growth faults and by salt-related structures. Salt forms the most prominent set of structures in the Houston diapir province of southeast Texas. Recent work in three study areas shows that the Tertiary growth-fault trends, so well displayed along strike to the southwest, continue through this salt basin as well, but they have been deformed by later salt movement.

In the Katy area, seismic data disclose early (pre-Wilcox) salt pillows downdip of the Cretaceous reef trend. Progradation of the lower Wilcox Rockdale delta system created a linear growth-fault trend above and seaward of the pillows. Salt stocks were injected upward from the pillows during Claiborne deposition, and were flanked by deep withdrawal basins and turtle structures. Major oil accumulations occur over an inferred turtle structure and over deep-seated salt domes. The lower Wilcox growth-fault trend deformed by the later salt flowage, is virtually unexplored, although geopressured gas production from these low-permeability deltaic reservoirs exists in adjacent areas.

In Brazoria County, a major lower Frio growth-fault trend, affecting the Houston delta system, was deformed by later salt domes, by a salt-withdrawal basin, and by a possible turtle structure at Chocolate Bayou. A productive geopressured aquifer exists in the salt-withdrawal basin bounded by the previously formed growth faults. In Jefferson County, in contrast, salt-tectonic activity and growth faulting appear to have been coeval. Early salt-cored ridges continued to rise throughout Frio deposition; growth faults occur both updip and downdip. Salt diapirism may have occurred throughout Frio deposition at Orange and Port Neches salt domes, but other domes such as Spindletop formed in post-Frio time. Hydrocarbons accumulated over the salt domes in growth-fault anticlines and in stratigraphic traps. Contemporaneous, low-intensity growth faulting and salt movement may be ascribed to the minimal loading imposed by the sand-poor lower and middle Frio section.

Recognition that shelf-margin growth faulting preceded the development of the present pattern of domes and basins has important implications for hydrocarbon exploration. Growth faults may be migration paths for hydrocarbons; furthermore, early formed traps, distorted by salt movement, may still be found to contain hydrocarbons.

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Cretaceous and Tertiary Samples Dredged from Florida Escarpment, Eastern Gulf of Mexico

Cretaceous and Tertiary rocks were dredged along the Florida Escarpment at five areas south of 27°05′N in late 1982 during cruise LY-82A of USNS *Lynch*. The escarpment was sampled from near the base (as deep as 3,300 m, 10,800 ft) to near the top (as shallow as 1,500 m, 4,900 ft) of the slope. The majority of samples recovered are middle Cretaceous peritidal and lagoonal limestones and dolomites deposited under restricted, low-energy conditions. Presumed middle Cretaceous dolomites deposited in hypersaline bank-interior environments were taken primarily from the walls of canyons incised from 10 to 50 km (6 to 30 mi) into the escarpment, and also from the escarpment proper at several dredge stations. Limestone lithologic characteristics are generally bioturbated miliolid and mollusk wackestone/packstone (lagoonal) and fenestral and algal-laminated mudstone/wackestone (peritidal). Some dolomites retain primary sedimentary structures (e.g., mottling and algal lamination), whereas others appear structureless, perhaps due to recrystallization. Few of the middle Cretaceous samples were deposited under high-energy conditions. Those that are high-energy deposits are bioclastic rudstones and coral boundstones. Late Cretaceous and Tertiary deep-water limestones and chalks unconformably overlie and drape the older shallow-water carbonates. The limestones are Late Cretaceous in age, while the chalks range from Late Cretaceous through Pleistocene. The limited occurrence of high-energy facies rocks indicates that the escarpment has been eroded bankward over its entire length south of 27°05′N, and not just at canyon reentrants. The younger deep-water rocks reflect the drowning of the middle Cretaceous platform in Late Cretaceous time. The facies change from limestone to dolomite is attributed to higher salinities in the bank interior during the middle Cretaceous.

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Exploration and Development of Lobate Back-Barrier Facies Sandstones

Lobate back-barrier sandstones deposited as washover fans and flood-tidal deltas are major reservoirs for stratigraphically trapped hydrocarbons on the Gulf Coast. Understanding back-barrier facies relationships can improve the efficiency of exploration and development in three ways: (1) recognition of their irregular to lobate geometry (rather than simply linear parallel to depositional strike) allows more accurate predictive reservoir mapping, (2) detailed correlation and mapping of each individual wedge of reservoir provides more precise determination of the updip pinch-out, and (3) resistive zones on electric logs, representing coals or tight sandstones, can be used as "adjacent clues" to the nearby presence of a back-barrier reservoir. Application of these concepts in south Texas led to extension of the previously abandoned Draper field.

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Multiple Zone Coal Degasification Potential in Warrior Coal Field of Alabama

The upper Pottsville Formation in the Warrior coal field of Alabama has seven recognized groups of bituminous coal seams. Three of these groups, the Pratt, Mary Lee, and Black Creek, consist of seams containing commercially significant quantities of methane. Each group has several seams within a vertical interval that, in many areas, can be stimulated collectively. In parts of the Warrior coal field, where all three groups can be penetrated in one vertical borehole, the potential production from multiple zone completion wells can result in commercially profitable wells. Various open-hole and through-the-casing completion procedures are being applied, resulting in successful methane production from these multiple zone coal gas wells.