lithologic variation, an aid to local correlation of sequences, and a basis for environmental interpretation. Type (3) elements are of particular economic importance as the main reservoir rock of the hydrocarbon-bearing Viking Formation.

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WELL DATA FILES AND COMPUTER—EXPLORATION TOOLS FOR 1970s

Computer processable well data systems in the United States and Canada contain information of more than 700,000 wells. The use of computers to extract, analyze, and display this information is essential for economically efficient exploration where large amounts of data are available.

A systematic approach to exploration using the well data files and computer methods can improve exploration decision making. One case study demonstrates the use of well data files for the analysis of future gas potential in the northern Rocky Mountains. Another case history illustrates file applications that were used to evaluate the Muddy reservoir in the Powder River basin. Data in the Rocky Mountain well data file were used to delineate prospective Muddy trends on which subsequent drilling has discovered more than 250 million bbl of oil.

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COMBINATION FORMULA UNLOCKING LOWER TYLER "POINT BAR" EXTENSIONS IN CENTRAL MONTANA

The lower Tyler Formation of central Montana is oil productive from sinuous, point-bar sands deposited in a Pennsylvanian river channel. These hydrocarbon-bearing bars are hard to locate, and successfully offsetting a discovery is commonly difficult.

Combining the dipmeter with subsurface data and sample cutting studies is a method that will eliminate some dry holes.

Subsurface data indicate the location of the channel, the amount of erosion into underlying beds, and the type of channel fill. Sample cuttings show the type of bar facies found. The dipmeter illustrates the water-sediment transport direction and the deviations of dip within each facies change.

These 3 tools used together will produce a more accurate subsurface picture to determine which offsetting location will produce a field extension.

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LOWER CRETACEOUS COMBINATION TRAPS IN BIG MUDDY–SOUTH GLENROCK AREA, WYOMING

In the Big Muddy-South Glenrock field area, Natrona County, Wyoming, probably 100 million bbl of oil will be produced ultimately from 3 separate sandstone reservoirs within the Lower Cretaceous section; from oldest to youngest, the Dakota, the lower Muddy, and the upper Muddy. Entrapment of oil in each of these producing zones is the result of updip pinchout or facies change from porous and permeable sandstone to nonreservoir shale, siltstone, or sandstone, assisted by a favorable hydrodynamic environment.

Each of these sandstone reservoirs occupies a flank position around and across the east plunge of the Big Muddy anticline. Isoliths of permeable Dakota sandstone in the producing area and the regional pattern of sandstone distribution, together with the lithologic characteristics of the Dakota sandstones, suggest deposition within northeasterly flowing rivers that drained an incipient Big Muddy uplift and emptied into the sea near Glenrock. Sand delivered to the sea was distributed along a northwest-trending shoreline by relatively low-energy, destructive, marine processes accompanying the upper Dakota transgression. The Dakota pool at Big Muddy-South Glenrock has a continuous oil column more than 2,500 ft in length and an anomalous, inclined oil-water contact.

The lower Muddy sandstone pool also appears to be a single, continuous reservoir with a vertical oil column of at least 2,500 ft. This sinuous sandstone reservoir trends northeast along the southeast flank and around the east plunge of the Big Muddy anticline and has the classic meander morphology of a fluvial river deposit. The physical dimensions of this northeasterly flowing river are comparable with the upper reaches of the present Mississippi River. The influence of probable structural growth along the Big Muddy axis on the radius of meander curvature and depth of the scour channel in the lower Muddy river is particularly evident.

In the upper Muddy sandstone interval 2 nearly parallel sandstone pools trend essentially north-south across the east-plunging Big Muddy axis, and have the typical lithologic and morphologic characteristics of marine shoreline or barrier-bar deposits. Each pool has a vertical oil column of about 1,500 ft.

Regional mapping of the potentiometric surface of the 3 Lower Cretaceous producing intervals and the unusually long oil columns in each of the Lower Cretaceous sandstone pools at Big Muddy-South Glenrock indicate that a favorable downdip hydrodynamic flow must exist in the area of oil accumulation and must be enhancing the oil-holding capacity of the updip barrier zones.

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STRATIGRAPHY AND EXPLORATION OF LOWER CRETACEOUS MUDDY FORMATION, NORTHERN POWDER RIVER BASIN, WYOMING AND MONTANA

The Lower Cretaceous Muddy Formation in the Northern Powder River Basin of Wyoming and Montana was deposited during a marine transgression across a stream-dissected surface of the underlying Skull Creek Shale. The transgression occurred over most of the area, but was limited by a prograding delta on the northeast which supplied most of the sand for the area.

The Muddy Formation is divided into 2 units—lower and upper. The lower Muddy was restricted to a system of dendritic channels which were incised into the Skull Creek Shale during a period of emergence. The sands were supplied from the delta on the northeast and transported south by longshore currents. They were deposited principally in a transitional marine and estuarine environment, and are comprised of fine-grained moderately sorted, partly clay-filled quartzose sands.

By the time of deposition of the upper Muddy unit the incised depressions in the Skull Creek topography had been filled largely and the upper Muddy sands were deposited in a complex marine shoreline environment which resulted in offshore bars, barrier islands, beaches, and tidal deposits.