and pore lining probably aided in preservation of porosity by inhibiting cementation.

Highest porosities and permeabilities are found where the sandstones have the highest secondary porosities as determined by petrographic study. Porosity increases from about 15% to as much as 20% in the section from 9,642 to 12,586 ft (2,939 to 3,836 m). This increase is related to the abnormally high pressure gradient of about 0.92 psi/ft (20.8 kPa/m) and to an elevated geothermal gradient of about 2°F/100 ft. Optimum reservoir properties are present where late stage cementation by clays and iron-rich calcite has not been extensive.

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Geology of Subsurface Eocene Cockfield Formation, Southern Allen Parish, Louisiana

A regional study of the subsurface Cockfield Formation (Eocene), southern Allen Parish, Louisiana, reveals that it was deposited as a result of the action of longshore currents and deltaic distributary channels within a nearshore marine environment. The juxtaposing of reservoir quality sands and marine shales within this environment created favorable conditions for the formation and entrapment of hydrocarbons. The Cockfield trend, a major oil and gas producing belt through the study region, appears to be composed mainly of fields that have combination stratigraphic-structural style entrapments. Localized sand pinch-outs and permeability barriers on "rollover" anticlines that developed on the downthrown sides of faults are responsible for most accumulations. Faults evidently controlled sand deposition in some parts of the study area, resulting in thicker deposits of sand on their downthrown blocks. Thickening of section within the Cockfield is present in isolated areas, and is confined to relatively short stratigraphic intervals.

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Petroleum Geology of South Carlton Field, Lower Tuscaloosa "Pilot Sand," Clarke and Baldwin Counties, Alabama

Petroleum production from South Carlton field, southern Clarke and northern Baldwin Counties, Alabama, is primarily from the lower Tuscaloosa "Pilot Sand" of Late Cretaceous age. The Pilot is a massive, green-brown micaceous, fossiliferous, glauconitic, very fine to medium-grained, quartzose sandstone. Texturally, the sandstone is submature with the quartz grains being subangular to subrounded and moderately to moderately well sorted. The sand body displays a decrease in grain size, sorting, and roundness from the base to the top of the unit. The sandstone has a maximum thickness of 71 ft (22 m) in the northern part of the field. Usually overlying the Pilot is a gray, silty, oyster-bearing packstone. The packstone is overlain by the "Marine Shale" which consists of dark-gray, silty, micaceous, fossiliferous, laminated claystone. This claystone contains a diverse fossil assemblage, indicating open marine-shelf sedimentation. The Pilot Sand is underlain by an interbedded sandstone and claystone interval, which is separated from the "Massive Sand" by a silty claystone.

The spontaneous-potential pattern for the Pilot Sand illustrates a gradational lower contact and a sharp upper contact. Constructed cross sections indicate the Pilot thins and becomes argillaceous immediately east and west of the field. The sedimentary rock characteristics, including an elongate northeast to southwest strike-trending morphology, and well-log properties of the sandstone suggest it accumulated as part of a marine-bar complex.

Porosity in the Pilot is principally intergranular and averages 27.3%. Average permeability is 183 md, and oil saturation can be as much as 42%. The Marine Shale above the Pilot Sand and claystone from the interbedded interval underlying the Pilot have potential as petroleum source rocks. The overlying packstone and Marine Shale make excellent seal rocks. The petroleum trap is a combination of stratigraphy and structure. The structural element is most critical and involves salt movement which has resulted in a domal feature. The crude oil trapped by the salt dome is a heavy oil having a chemical composition of an immature oil.

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Estimation of Uncertainty in Coal Resources

The use of alternate energy sources to supplement dwindling domestic petroleum resources will increase in the future. Among alternate resources, coal will contribute greatly to the future energy mix. Official estimates of the United States coal resources published during the past 15 years range from less than 1.7 to as much as 3.9-trillion short tons (1.5 to 3.5-trillion metric tons). These differences imply that a high degree of uncertainty exists in resource assessment.

A comparison of variability in coal resource estimates in areas of different ancient depositional environments is examined in an attempt to utilize depositional systems for improved coal resource estimates.

The Texas Gulf Coast basin was chosen to develop the methodology of resource evaluation because it exhibits a full range of ancient depositional environments. Two lignite deposits are evaluated, one from the alluvial plain setting of the Wilcox Group in east Texas and the other from the delta plain setting of the Jackson Group in east Texas.

Important sources of uncertainty in resource estimation include variability of seam thickness and areal distribution. To test the degree of uncertainty caused by variations in seam thickness, the numbers of boreholes considered in each lignite deposit are reduced and resources are calculated for each reduction in data.

Classical statistical methods are used to determine the number of boreholes required to obtain resource estimates of individual seams within a given confidence interval and specified conditions. Geostatistics (variograms and kriging) are used to measure variability in resource estimates.

These studies show that the minimum number of boreholes required to characterize coal resources within an accuracy of 20% for example, is substantially less than might be expected intuitively, and that the degree of assuredness depends on the coefficient of variation of the data analyzed.

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Near-Surface Lignites of Wilcox Group in East-Central Texas

As lignite becomes a major energy resource in Texas, information concerning the distribution, quality, and quantity of lignite available for utilization is becoming necessary for future planning. This paper presents the findings of an ongoing study concerning the distribution, depositional environments, and exploitability of near-surface lignites in the Wilcox Group of east-central Texas.

Fifteen hundred geophysical logs from closely spaced