those which are nonfabric related. Primary fabric-related types consist of intraparticle and interparticle. Primary intraparticle porosity, openings within the body chambers of the rudists, is present in the caprinid-coral wackestone, coral-caprinid boundstone, and requienid boundstone. Primary interparticle porosity was originally very high (greater than 30 percent) in the rudist grainstone facies but cementation soon after deposition—submarine, phreatic, and meteoric—reduced the porosity to less than 10 percent, and late subsurface cementation filled the remaining porosity. Primary interparticle porosity now is present only in a few very thin intervals.

Secondary fabric related porosity consists of solution-enlarged interparticle and moldic. Both occur in the boundstone and grainstone facies but in very thin restricted units. The poor development of solution enlarged interparticle and moldic porosity reflects the minor role that subaerial exposure played during the development of Stuart City trend.

Nonfabric related porosity consists of vertical fractures. This type of porosity is present in abundance in several studied wells in the form of open, nonlined, vertical fractures.

The low porosities along the Stuart City Trend are the result of two processes—(1) lack of significant periods of subaerial exposure for development of secondary porosity types and (2) massive cementation which destroyed primary porosity. Further exploration along this trend should be aimed at identifying areas which may have been exposed soon after deposition and developed secondary porosity or areas which subsided more rapidly and have preserved primary porosity.

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Analysis of Water-Level-Rise Effects on Littoral Transport

A computer project has included evaluation of the effects of changes in wave height, wave period, wave-approach angle, bottom slope, and water depth on beach erosion. This work is primarily applicable to large lakes where long-term changes in water level may be as much as one or two m. The change in potential erosion is expressed as a ratio of littoral power values. The most important independent variable entering into this ratio is the change in water level. An increase in level of one or two m can give ratios in the range of 100 to 250 and even higher. A ratio of 100 means that, after the rise in level, the littoral component of power, and hence the amount of sand eroded and transported, is initially 100 times as great as prior to the rise.

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Environmental Geologic Atlas, Texas Coastal Zone: Role of Geology in Land-Use Planning

The *Environmental Geologic Atlas of the Texas Coastal Zone*, which required 25 man-years of research, was initiated in 1969 to meet a growing need for basic land resource information about one of the most rapidly developing regions of Texas. The coastal zone, covering about 20,000 sq mi, is not only an area of accelerating, competitive, and, sometimes, conflicting land use, but it is also a region of dynamic natural processes and delicately balanced environments. The coastal zone is underlain by a wide variety of Pleistocene and Holocene/modern facies with differing physical properties and land-use capabilities. Large-scale mapping (1:24,000) of first-order units, including substrates, biology, processes, and man-made features, resulted in the principal environmental resource document—the Environmental Geology Map. This map, at a scale of 1:125,000, displays the distribution of 130 units, which comprise both Pleistocene and Holocene/modern fluvial, deltaic, barrier-strandplain-chenier, offshore, bay-lagoon-estuary, marsh-swamp, eolian, and man-made coastal systems.

A series of 8 Special-Use Environmental Maps at a scale of 1:250,000 were, in part, derived from the Environmental Geology Map, and, in part, compiled from other extensive data sources. The special-use map series includes: Physical Properties; Environments and Biologic Assemblages; Current Land Use; Mineral and Energy Resources; Active Processes; Man-Made Features and Water Systems; Rainfall, Stream Discharge, and Surface Salinity; and Topography and Bathymetry. These maps, which contain about 150 units, were designed for the special requirements of various users; an almost unlimited number of such special-use and thematic maps can be generated from the basic map data.

A further step toward application of environmental geologic information in land-use planning was derivation of fundamental planning units based on carrying capacity. These units alternately have been termed resource-capability units and land-resource units. Each land-resource unit is an areally defined entity that exhibits a unique set of properties, which limits or sustains its use for the wide variety of human activities. The properties of land-resource or resource-capability units, which can be quantified and digitized, may serve as principal input into land-use inventory and planning systems being devised to support future land-use decisions. A land-use planning system that is based realistically upon the nature and variability of natural systems and coastal substrates can provide a commonsense, flexible, and fair approach to land-use planning. Such a system provides potential users with options long before development becomes a reality, enabling users to plan for necessary engineering improvements and/or economic trade-offs. Fundamental geology is a critical element in such a land-use decision system.

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Permeability of Unconsolidated and Consolidated Marine Sediments, Gulf of Mexico

Permeability of a large number of natural marine sediment samples from the Gulf of Mexico was determined through the use of laboratory consolidation tests. The samples were divided into groups as follows. Group 1, sediment consisting of more than 80 percent clay (material 2μ or less in size); Group 2, sediment containing from 60 to 80 percent clay-size material; Group 3, silty clays with less than 60 percent clay; Group 4, silts and clays that have a significant sand-size fraction present (more than 5 percent sand). The permeabilities of the groups ranged from 10^{-5} to 10^{-10} cm/sec with 35 ppm normal seawater being used as the saturating fluid.

A statistical analysis of the natural log of permeability versus porosity was used to develop the permeability prediction equation for each of the groups listed. The equation for Group 1 is $k = e^{P(15.05) - 27.37}$, for Group 2 $k = e^{P(14.18) - 26.50}$, for Group 3 $k = e^{P(15.59) - 26.65}$, for Group 4 $k = e^{P(17.51) - 26.93)}$, and for all data $k = e^{P(14.30) - 26.30}$, where P is the porosity (in decimal) and k is the coefficient of permeability.

These equations are useful for predicting changes in permeability with depth in fine grained sediments of the Gulf of Mexico. The ability to predict permeability in a continuous sequence, where the deposition history is known, may explain the large variations that we see in the physical properties in sediments similar in grain size and mineralogy.

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Recognition of New Potential of Swan Lake Field, Jackson County, Texas

A new geologic evaluation of Swan Lake field led to the discovery of 24 new reservoirs. The field originally was found in March 1950; initial development drilling ended in 1957. Sun Oil Co. took over operations in 1970. A new lower Frio structural