of the locale should be attained and then used to slightly modify the computer program prior to use. This method is limited to clean unconsolidated sands, 100 percent water saturated.

SOLUTION FEATURES OF UPPER CIBOLO CREEK BASIN

Knox, Jan, Texas Water Development Board
Austin, Texas 78711

Cibolo Creek is a major tributary of the San Antonio River. At its headwaters, Cibolo Creek has incised into the southeastern margin of the Edwards Plateau. From its source in Kerr County, it flows east-southeast across Cretaceous limestones and marls until it reaches the Balcones Fault Zone. As Cibolo Creek crosses the fault zone, it flows over a downfaulted section of the Edwards Formation. It then continues over successively younger formations of Cretaceous age finally passing over beds of Tertiary age to its confluence with the San Antonio River.

Due to San Antonio's sole dependence on the Edwards Limestone Aquifer for its municipal and industrial water supply, and the increasing urban growth in the Hill Country of Central Texas, an effort was made to refine the areas of recharge to the limestone aquifers of the region. The distribution of solution features was correlated with other geologic and hydrologic data in the Upper Cibolo Creek Basin.

LINEATIONS AND ACTIVE FAULTING IN THE HOUSTON-GALVESTON AREA OF SUBSIDENCE*

Kreitler, Charles W., Bureau of Economic Geology, The University of Texas at Austin, Austin, Texas 78712

Lineations identified by aerial photography of Pleistocene and Recent sediments in the Houston-Galveston area appear to be surficial expressions of active or potentially active faults. Lineations coincide with the extensions of known subsurface faults to the surface, as well as coinciding with active faults that produce topographic scarps and damage houses, apartment complexes, highways, and the reflection pool at the San Jacinto Monument.

Subsidence profiles constructed with the 1942, 1959, 1964, and 1973 National Geodetic Survey, first-order, horizontal-control bench marks for the Houston-Galveston area show that lineations coincide with abrupt changes in the amount of subsidence. Lineations intersecting more than one profile often intersect each profile at similar breaks in the amount of subsidence.

Lineations have become active faults where there has been more than one foot of subsidence. All active faults found to date are within this zone. Data from monitoring of three faults in Houston indicate a direct correlation between decline in the potentiometric surface and fault movement.

The identification of lineations is an important predictive tool in identifying potentially active faults which may be activated with advent of extensive groundwater withdrawal.

*Publication authorized by the Director, Bureau of Economic Geology, The University of Texas at Austin.

UNITED STATES ENERGY SUPPLY

Langston, J. D., Exxon Company, U.S.A.
P. O. Box 2180, Houston, Texas 77001

The United States is not supplying our present energy demands from domestic resources. Energy demand is projected to increase, with most of the increase being supplied from abroad.

Domestic liquid production is projected to decline moderately until 1977 and then to increase slightly as Alaskan supplies become available. However, newly found domestic oil can probably do no more than just offset declines in older fields.

Natural gas provides one-third of our nation's energy. Gas price controls have created an abnormally high demand while at the same time limiting incentives for further exploration.

Most of the energy growth in the electric utility sector is projected to be satisfied by nuclear power. However, the nuclear industry has problems. Lead times to site facilities are long.

Our nation's abundant coal and lignite resources are expected to be in heaviest demand by the industrial sector in the late 1980s. Future development is dependent on solving environmental problems and implementing commercial processes for synthetics.

Hydro power's relatively minor energy contribution is further limited by a paucity of additional available sites.

Energy sources such as geothermal, oil shale, tar sands, and solar/thermal are expected to play a minor role through the mid-1980s.

Increases in energy demand for the next 10 years can only be met by petroleum supplies. Thus, it is necessary to encourage domestic exploration, especially of new offshore frontier areas. The government, industry, and the public must fully cooperate to ensure adequate energy supplies while concurrently conserving use of oil energy.

STUDY OF EFFECT OF STRAIN RATES, PRESSURE, AND KEROGEN CONTENT UPON FAILURE STRENGTH OF OIL SHALE

Lankford, James, Department of Materials Sciences, Southwest Research Institute, San Antonio, Texas 78284

The process of in-situ retorting of oil shale requires explosive loading under overburden pressure to accomplish rubblization of rock masses. Therefore, a study of the dynamic, confined failure strength under compressive loading was carried out for shale ranging in kerogen content from 11 - 45 gals./ton. Strain rates ranged from 10^{-4} - 10^{3}/sec, and pressures from 0 - 1.3 kb. It was found that the envelope of ultimate strength could be described by a first order failure criterion which expands uniformly in principal stress space about the hydrostatic axis with increasing strain rate. The strength-log strain rate dependence was found to be nonlinear, with the strength doubling over seven decades in strain rate. For these laboratory tests, considerable ductility to failure was encountered, ranging from 2 - 35%. Such inelastic strains, accompanied by marked barreling, are not likely to prevail in large rock masses. Failure strength was consistently ordered with respect to kerogen content, but the strength-reducing presence of large calcite inclusions in the leanest grade of shale overcame the effect of lower kerogen content to the extent that specimens of intermediate richness exhibited the highest strength.