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U.S. Geological Survey Methods for OCS Tract Evaluations

In deciding whether to accept or to reject high bids for offshore oil and gas leases, the Secretary of the Interior relies in large part on the U.S. Geological Survey (USGS) presale estimate of the resource potential and monetary value of each tract. The information on which the USGS evaluation is based is essentially the same as that used by industry—geologic and geophysical data collected by industry under permit and well data from stratigraphic tests and from any wells drilled on leases in the sale area. Engineering and economic analyses are made for each tract, and probabilistic methods are used to treat uncertainties in the data. Monte Carlo simulation of discounted cash flows is used to derive an expected net present monetary value.

Probabilistic discounted cash-flow methods are commonly used by industry in evaluating projects. Any major differences between USGS methods and those used by most bidders in tract evaluations lie in the level of detail at which the geology, engineering, and economics are modeled and in the scope of factors considered. The USGS model can accept over 100 parameters for a relatively simple tract and many more for a tract in a complex setting. However, the USGS model is strictly an "expected value" model, based on the net worth of the tract to a taxpaying corporation as an independent business venture or as a partner in a logical production unit. None of the elements of evaluation relate to corporate financial positions or corporate bidding strategies.

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Prudhoe Bay, a Ten-Year Perspective

No abstract available.

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Mesozoic-Cenozoic Sedimentary Formations of North American Basin, Western North Atlantic

The Mesozoic and Cenozoic rocks and sediments penetrated at Deep Sea Drilling Project sites in the North American basin show similar sequences of lithology, age, faunal assemblages, and petrographic composition, thus permitting recognition of six formations. These formations were mapped using a combination of reflection seismic data and drilling results.

Pelagic limestones dominate the Late Jurassic–Early Cretaceous; the oldest rocks are Oxfordian. These sediments were deposited in a deep bathyal environment above the carbonate compensation depth (CCD). The CCD shoaled abruptly in the Barremian; this shoaling was accompanied by development of euxinic conditions and formation of carbonaceous shales which continued through the Cenomanian. Starved-basin conditions and a shallow CCD resulted in deposition of pelagic multicolored clays in the Late Cretaceous. The presence of Maestrichtian chalks above carbonate-poor Late Cretaceous clayey deposits indicates abrupt but temporary deepening of the CCD in the North American basin in the latest Cretaceous.

Deposition dominated by clayey sediments continued into the Paleocene on the Bermuda Rise, the only locality where this interval is represented. Siliceous deposits accumulated during early and middle Eocene time, probably below the CCD; the resultant cherty unit is a prominent seismic reflector (horizon A^c over much of the North American basin. The late Eocene and Oligocene are represented by clays, siliceous clays, and mass-flow deposits in the Bermuda Rise area. Along the continental margin, a major unconformity dated as late Eocene to Oligocene bevels Eocene to Lower Cretaceous rocks. Hemipelagic deposition of gray-green mud was dominant in the North American basin throughout the Neogene and continues to the present.

JOHNSON, KENNETH S., and JOHN F. ROBERTS, Oklahoma Geol. Survey, Norman, Okla.

Potential for Subsurface Disposal of Industrial Wastes in Oklahoma

The main goal in selection of a subsurface disposal site is that the waste be emplaced in such a manner that it is isolated from freshwater supplies and the biosphere during its hazardous life. This can be accomplished only through detailed investigation of the lithology, porosity, permeability, thickness, lateral extent, depth, fluid content, and compatibility of a potential reservoir. Additional data for the area around a potential disposal site are also needed concerning the structure, geologic framework, confining rocks, hydrology, mineral resources, and the presence of boreholes or other excavations.

Rock types that are most desirable for subsurface waste disposal in Oklahoma are porous and permeable sedimentary rocks, such as sandstone, limestone, and dolomite, although fractured shale or mined caverns in shale and salt may also be suitable. Thick sequences of sedimentary rock make up most geologic provinces in the state, and it appears that most areas are underlain by reservoir rocks that locally can safely contain industrial wastes.

Major sandstone reservoirs that are locally capable of accepting liquid wastes include the Simpson Group, Springer Formation, Pennsylvanian sandstones, granite wash, and Permian sandstones; major carbonate reservoirs include the Arbuckle Group, Hunton Group, Mississippian limestones, Brown dolomite, and Permian dolomites. Where used for waste disposal, these reservoirs typically have porosities ranging from 5 to 20% and permeabilities ranging from 20 to 2,000 md.

At present, 17 wells are being used in Oklahoma to inject acids, caustics, solvents, process waters, salt water, paints, urea, detergents, metal-bearing solutions, and cement slurries into reservoirs 385 to 7,350 ft (116 to 2,205 m) below the surface. Most facilities inject at average rates of 40,000 to 400,000 gal/day and with injection pressures that range from 380 to 450 psi (2,618 to 3,100 kPa).

JONAS, EDWARD C., and OMER I. ECE, Univ. Texas, Austin, Tex.

Microscopic Distribution of Uranium in Oakville Sandstone, South Texas

When uranium ore is mined and processed in the conventional crushing plant there is little urgency to know what mineral contains the uranium and how that mineral is distributed within the ore. However, solution mining techniques depend for their success on bringing the dissolving solutions into contact with the uranium-bearing mineral and dissolving it. With that requirement in mind, a study was undertaken to help understand the character and location of the uranium-bearing mineral in the Oakville Sandstone of south Texas where solution mining is being carried out.

Thin-section and electron-microprobe analyses were conducted on a sample of high concentration ore to confirm that uranium was located in the space between framework sand grains. Moreover, uranium was not uniformly distributed throughout the silt and clay intergranular matrix material. The disaggregated and fractionated sandstone showed the highest concentration of uranium to be in the silt-size fraction. Further separation of the ore was carried out by heavy liquids and magnetic fractionations. The uranium-bearing mineral was concentrated along with dense and magnetic minerals. Openwork intergrowths of pyrite crystals made up most of this fraction. In spite of having concentrated uranium in excess of 43,000 ppm U_3O_8, it was still not possible to identify any uranium-bearing mineral by X-ray diffraction. This suggests that uranium may be held in the sandstone as an amorphous oxide.

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Integration of Microscopic Organic Analysis and Geochemical Measurements in Evaluation of Source Rocks

A major problem facing all scientists working in the field of source rock evaluation is choice of an analytic mix which yields necessary and sufficient data that are dependable, economical, and not unnecessarily redundant. Chevron handles this problem by combining microscopic observations with measurements of the total organic carbon (TOC) and the hydrogen-carbon (H/C) ratio of the organic matter (OM). This combination of analyses yields two independent estimates of organic quantity, quality (type), and maturation, the three organic parameters which are necessary for a proper source-rock evaluation.

Despite the strong subjective element, we consider microscopic organic analysis (MOA) indispensable to an accurate evaluation of organic quality and maturation. In addition, MOA is useful in detecting analytic errors in geochemical measurements, uphole cave, contamination from organic well additives, and the presence of reworked OM. MOA is, however, quite subjective and requires continuous calibration against geochemical numbers to minimize errors in judgment.

Geochemical analyses of kerogens are objective, precise, accurate, lend themselves readily to comparison between different laboratories, and are appealing both to geologists using source-rock data and to management. However, most of them are bulk measurements and cannot resolve the kerogen into its components as can microscopic analysis. In addition, many geochemical measurements do not discriminate between effects due to maturation and effects due to different organic types.

Used together, MOA and geochemistry strongly complement each other and minimize the possibilities of incorrect interpretation of the generative potential and generative history of the OM.

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Predictions of Oil or Gas Potential by Near-Surface Geochemistry

No abstract available.

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Interactive Modeling and Interpretation of Two-Dimensional Gravity and Magnetics Data

The number of possible interpretations of a gravity or magnetic profile is reduced by the presence of other geophysical or geologic data. Experience, common sense, and a newly developed interactive modeling program make it possible to examine and choose among those that remain. The interactive modeling program is based on Talwani's algorithm and includes features which make it possible to change the geometry and properties of the causative bodies and quickly observe the results.

JORDAN, TERESA E., Stanford Univ., Stanford, Calif.

Bathymetric Distribution of Trace Fossils in Upper Pennsylvanian and Lower Permian, Western Oquirrh Basin, Utah

Detailed study of the Oquirrh Group in Tooele and Box Elder Counties, Utah, has revealed a history of basin development during the Late Pennsylvanian and Early Permian. Trace fossils are of paramount significance in recognizing depositional environments in this sequence (a) because of uniform composition and uniform grain size and (b) because most megafossils were redeposited several miles or more from their initial growth sites.

Middle Pennsylvanian littoral and inner-shelf limestones and quartz arenites form the base of the sequence studied. During Late Pennsylvanian time, the western Oquirrh basin area was primarily an outer-shelf environment. Trace fossils in shelf units are diverse, recording a variety of behavior patterns, and include *Zoophycos, Teichichnus*, and *Helminthoida* in the Hogup/Terrace Mountains and *Zoophycos, Phycodes, Helminthoida*, and *Spirophycus*(?) in the Grassy Mountains.

Rapid subsidence in latest Pennsylvanian–earliest Permian time is marked by conglomerates and arenites that carried shallow-water fossils into the bathyal envi-