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MASTER

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METC/EGSP--503

DE82 013285

MORGANTOWN ENERGY TECHNOLOGY CENTER

ISOPACH MAP OF
HIGHLY RADIOACTIVE BLACK SHALE IN
THE WEST FALLS FORMATION IN KENTUCKY

By S. B. Dillman and F. R. Ettensohn

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Prepared by

DEPARTMENT OF GEOLOGY, UNIVERSITY OF KENTUCKY
KENTUCKY RESEARCH GROUP

Contract Number EY-76-C-05-5202

UNITED STATES
DEPARTMENT OF ENERGY

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PREPARED UNDER CONTRACT TO THE
EASTERN GAS SHALES PROJECT
(EGSP) 1981

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SAMPLE LOG SHOWING
RADIOACTIVITY BASELINE

Thickens of black shale above the 20 API baseline (shaded on diagram) were isopach.

SAMPLE LOG-STRATIGRAPHIC CHART

PREPARED BY
S.B. Dillman and F.R. Ettensohn
1981

Department of Geology, University of Kentucky
Kentucky Research Group
under contract to the
Eastern Gas Shales Project,
Contract Number EY-76-C-05-5202

Base Map from Kentucky Geological Survey

Drafting by Dana L. Antoine
and John P. Farrell

DISCUSSION

The Upper Devonian-Mississippian black shale sequence has an organic content that ranges up to 22 million tons per square mile, creating a tremendous fuel potential (Smith and Young, 1987). Most of this fuel potential is in the form of gas, but with further advancements in technology, this sequence may become an important source of synthetic oil and uranium. The resource area encompasses approximately 120,000 square miles in the Appalachian, Illinois, and Michigan basins and has a tentative maximum gas-producing potential of 901 TCF (Morgantown Energy Technology Center, 1981). Further development of this resource will require increased knowledge about the distribution of organic matter in the various units of the black shale sequence. To this end, this map and others in the series were constructed as part of a black shale characterization study for the Department of Energy (D.O.E.) Eastern Gas Shales Project.

Because organic matter is the source of natural gas in these black shales, the amount of organic matter is a potential measure of total gas generated (Schneider, 1980). The amount of organic matter may be measured by various analytical means and estimated more subjectively by color and the use of density and gamma-ray logs (Schneider, 1979, 1980). Because the gamma-ray log is a measure of the natural radioactivity of the formations, and the radioactivity in turn is an appropriate measure of the amount of organic matter in a shale, gamma-ray logs can provide some measure of the amount of organic matter in the shales. Gamma-ray logs are nearly always run in black shale gas wells and are expected to use and readily available on most shale geologic surveys. Black shale radioactivity mostly reflects concentrations of uranium associated with the abundant organic fraction (Conant and Swenson, 1961). However, in some cases we have also noted that thin, organic-poor green shales within the black shale sequence will also produce high radioactivity deflections in gamma-ray logs and scintillometer profiles (Ettensohn and others, 1979). High radioactivity in green shales reflects radioactive potassium associated with the dominant clay fraction (Ettensohn and others, 1979). Nevertheless, the small size and number of green shales and their generally known stratigraphic occurrence (in Units 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 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