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J. A. McEntire III

Arkansas Geological Survey

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GEOLOGY ALONG A PORTION OF HIGHWAY 23, MADISON COUNTY, ARKANSAS

J. A. McEntire, III
Arkansas Geological Commission

A B S T R A C T

The Highway 23 area is located in the south-central part of Madison County, Arkansas, between the towns of Huntsville on the north and St. Paul on the south. East-west coverage extends from Highway 23, which is the longitudinal center of the area, in both directions to exposures of Winslow-age rocks, or to a distance necessary for geologic control and interpretation.

Surface rocks are sedimentary strata of the Mississippian and Pennsylvanian Systems. The former is represented by the Fayetteville and Pitkin Formations and the latter by the Hale, Bloyd and Winslow Formations. Stratigraphic units were deposited in a near-shore marine environment. Rocks of the Hale and Bloyd Formations are variable in composition and appearance reflecting complexities arising from near-shore terrigenous deposits coupled with organic reef development and associated marine detrital deposits.

The Fayetteville Formation is predominantly shale. The Wedington Sandstone Member is not exposed but was penetrated by several exploratory wells. Localized sections of limestone were also penetrated and may represent reef development. The Pitkin Formation is composed entirely of limestone, with the exception of thin discontinuous layers of shale and siltstone. Organic reefs are present and account for some variation in thickness. The Hale Formation is represented by both the Cane Hill and Prairie Grove Members. The Cane Hill Member is made up of siliceous siltstone with interbedded sandstone and limestone. The Prairie Grove Member is predominantly calcareous quartz sandstone but includes thick beds of limestone which contain organic reefs. The Cane Hill and Prairie Grove Members seem to intertongue regionally though they display erosional contacts locally. The Bloyd Formation is predominantly limestone with discontinuous lenses of shale, siltstone, and sandstone. Paleontological evidence indicates that the formation is represented by the Brentwood Limestone and Dye Shale Members. The basal unit of the Winslow Formation is the Greenland Sandstone Member which is a massive conglomeratic sandstone. Above the Greenland Sandstone Member the rocks consist of alternating beds of shale, siltstone and sandstone of varying thickness and random occurrence.

The lower shale of the Brentwood Member which may serve as a market bed between the Hale and Bloyd Formations

is absent over most of the Highway 23 area. As a result, limestone of the lower Bloyd Formation rests directly on limestone of the upper Hale Formation in places. Where this occurs several general criteria can be used in the field to distinguish the two formations. These are: (1) contacts between lithotypes are gradational in the Hale and abrupt in the Bloyd; (2) distinct lithotypes are traceable over considerable distance in the Hale whereas in the Bloyd they have little horizontal continuity; and (3) distinctive colors of Hale rocks are various shades of brown and those of Bloyd rocks are various shades of gray. In addition, results of laboratory work show that in general the insoluble residues of Hale and Bloyd carbonate rocks within the Highway 23 area are distinguishable. The amount of insoluble material in the Hale ranges from 14 to 40 percent with an average of 26 percent, and those of the Bloyd range from .06 to 18 percent, with an average of 6 percent. The colors of the insoluble material from the Hale are light-tan to brown and those of the Bloyd are light to dark gray. The diameter of the residue is from silt size to 1 mm in the Hale and from silt size to $\frac{1}{2}$ mm in the Bloyd.

A reef complex is exposed along the junction of War Eagle and Jackson Creeks in the northern part of the Highway 23 area. It is made up of a number of intertonguing and overlapping reefs. The reefs have the form of mounds or elliptical masses with maximum widths in excess of twice their height. Individual reefs consist of a reef core composed of dense algal limestone; reef flank strata, composed of bioclastic limestone; and inter-reef deposits of shale, calcareous quartz sandstone and detrital, fossiliferous limestone. Reef development began during late Hale time. It was not determined if reef development culminated at the end of Hale time or if it continued into Bloyd time.

Structures of the Highway 23 area include an east-west trending arch, northeast trending folds, gravity faults and a small collapse structure. The area lies between two major northeast trending anticlines: the Highway 71 anticline and the Highway 23 anticline. Northeast trending folds mapped within the Highway 23 area appear to be subsidiary folds associated with these major structures. A broad east-west trending syncline may be present to the south of the Highway 23 area. Hale and Bloyd age rocks which dip under the Winslow Formation in the southern part of the Highway 23 area are exposed approximately 10 miles to the south. Surface rocks of the intervening area are of Winslow age and the area is topographically lower than the Hale and Bloyd age outcrops.

Seven exploratory wells have been drilled in the Highway 23 area, one of which has penetrated the pre-Cambrian sur-

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face. Two wells tested for gas yielded over 1,000,000 cubic feet of gas per day. Oil shows are reported in six of the wells. The gas shows are restricted to wells located on structural highs, whereas oil shows are found in wells located on both structural highs and lows. There has been no commercial production of gas or oil in the Highway 23 area to date.