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WM-16 (2)

United States Department of the Interior

BUREAU OF MINES

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DENVER, COLORADO 80225

March 26, 1987

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Memorandum

To: Charlotte Abrams
Project Officer, Geotechnical Branch
Branch of Waste Management
U.S. Nuclear Regulatory Commision
Washington, D.C. 2055

From: NRC Project Coordinator, Minerals Availability Field Office

Subject: Review of BMI/ONWI-621 as requested by Work Directive 008 under Task Order 002.

Please find enclosed a review of the subject paper. As per your request, this review focuses on the geologic data and its interpretation. We selected Mr. Boleneus for this review, owing to his strong background and recent experience in petroleum geology.

Technical questions may be forwarded to Mr. David Boleneus at (303) 236-0423 if you call on the FTS system call 776-0423.

Hope all is well.

Donald I. Bleiwas

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United States Department of the Interior

BUREAU OF MINES

P. O. BOX 25086
BUILDING 20, DENVER FEDERAL CENTER
DENVER, COLORADO 80225

Memorandum

March 24, 1987

To: Don Bleiwas, Minerals Availability Field Office

Through: George Schottler, Chief, Branch of Engineering and Economic Analysis, Intermountain Field Operations Center

From: David Boleneus, geologist, Branch of Engineering and Economic Analysis

Subject: Review of BMI/ONWI-621 as requested by Work Directive 008 under Task Order 002.
Report Title: "Petroleum potential of two sites in Deaf Smith and Swisher counties, Texas Panhandle", vol 1(report) and vol 2 (exhibits) by Peter R. Rose.

Summary

This review mostly confirms the author's opinion that neither Site 1, located in Deaf Smith Co., nor Site 2, located in Swisher Co., contains any significant petroleum resource potential.

Site 1 obviously contains far less potential than Site 2, but based on hydrocarbon occurrence, expected cash value and structure location, the absolute potential of Site 2 should be more seriously downgraded than presented by Rose.

Data unavailable at time of Rose's writing which concerns the quality of the Mississippian oil source rocks at Site 2 should be more thoroughly evaluated, when obtained. However, based on experiences in like situations, I subjectively speculate that it may result in a small net loss of potential at Site 2, when summing all of the above effects.

Discussion

A. General comments

Upon critically reviewing the report, I found it to:

- be excellent in quality;
- be consistent with normal oil industry standards and practices;
- thoroughly cover all pertinent subjects based on existing and available data; and
- properly state, in general terms, the relative petroleum resource potential between Sites 1 and 2.

However, I disagree with Rose's stated--though understandably subjective--absolute assessment of potential for Site 2 for reasons given below.

B. Site 1:

I agree with Rose's evaluation that no petroleum resource potential exists. In arriving at this conclusion, two major "fatal flaws" play against developing of any potential here. They are:

1. Thermally-immature oil source strata have not generated any quantities of petroleum; and
2. No evidence exists to show that liquid petroleums have migrated through this area based on drill stem test data. I emphasize that the chances of success are 1:1,000 if not far less.

The cash value estimate carried out by Rose for the resource seems to be an unnecessary exercise, since Rose previously demonstrated that the site lacks potential. In relative terms, Site 1 contains less potential than Site 2.

C. Site 2:

Again, I generally agree with Rose's evaluation that minimal petroleum potential exists at Site 2; he states the probability at 2:100. Several serious deficiencies speak against developing any more than a very low potential for petroleum. Those deficiencies in the site area are: (1) thermally-immature oil source rocks, (2) existence of poor quality oil shows based on test data, and (3) site location outside of predicted oil migration pathways from deeper (i.e., thermally, more mature) portions of the Palo Duro basin.

Based on Rose's subject evaluation criteria, I would downgrade the petroleum potential at Site 2 more seriously than his conclusions indicate, for the following two reasons:

1. Hydrocarbon occurrence (p. 27-28) and expected cash value (p. 29-33). The expected cash value should be downgraded by 31% due to recent oil price reductions and likewise, the probability of discovering that hydrocarbon occurrence should be downgraded from 20% to 2% based on outside data (Dutton, 1980, fig. 8; Ruppel, 1987). Rose's oil price was valid at time of writing. The probability of failure of wildcat drilling is revised upward to 98.5% from Rose's more optimistic 80%, but only if one considers the three to four, stacked, Permian through Mississippian objectives, in combination.

2. Trap location (p. 33). If one considers Rose's "most likely" case (exhibit 14), both the northeast and southeast structural traps lie outside Site 2. The southeast structure is centered in section 4 and the northeast structure is centered in section 167. Therefore, any exploration or drilling activity would occur mostly outside of Site 2.

Additional data that concerns the source rock quality of the Mississippian strata were unavailable to Rose. This more recent data suggests that the Mississippian strata may deserve a better quality ranking for its oil source

and therefore it may act as an oil source around Site 2 (Ruppel, 1987). Rose's data support this reasoning that unrecognized limestone petroleum sources might exist because the "hotter" Mississippian strata are situated up to 2,000 feet deeper than overlying, more conventional shale-type oil sources in the Pennsylvanian strata.

Apparently, the Texas Bureau of Economic Geology (i.e., Ruppel) is in process of completing such a report. Both this and other unavailable information sources should be examined to better evaluate what, if any, oil source potential exists in the Mississippian strata.

Recommendations

If Site 2 is a consideration for a waste site, the NRC should investigate Ruppel's (1987) final report (Univ. of Texas, Bureau of Econ. Geology) and Dutton, et. al., (1982) report.

David Boleneus

Bibliography

Dutton, Shirley P., 1980, Petroleum souce rock potential and thermal maturity, Palo Duro basin, Texas: Univ of Texas, Bureau of Economic Geology, Circular 80-10

____, A.G. Goldstein, and S.C. Ruppel, 1982, Petroleum potential of the Palo Duro basin, Texas Panhandle: Report of Investigations #123, prepared for Dept of Energy, Bureau of Economic Geology, Univ of Texas, Austin.

Ruppel, Stephen, 1987, Mississippian potential in the Palo Duro basin: Stratigraphy and oil potential (part 1); Finding Palo Duro reservoirs will require synthesis of techniques (part 2): Oil and Gas Journal, Tulsa, Oklahoma, Feb. 9 and Feb 16, 1987 issues.