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QUARTERLY TECHNICAL PROGRESS REPORT

**TITLE: ENHANCED OIL RECOVERY UTILIZING HIGH-ANGLE WELLS IN
THE FRONTIER FORMATION, BADGER BASIN FIELD, PARK
COUNTY, WYOMING**

COOPERATIVE AGREEMENT No. DE-FC22-93BC14950

UNIVERSITY/INSTITUTION/LABORATORY: Sierra Energy Company

DATE OF REPORT: 14 January 1994

AWARD DATE: 21 October 1992

ANTICIPATED COMPLETION DATE: 31 December 1994

GOVERNMENT AWARD (Budget Period 9/19/93 to 12/31/94): \$922,287

PROGRAM MANAGER: John N. Augustine

PRINCIPAL INVESTIGATOR: Richard G. Fortmann

TECHNICAL PROJECT OFFICER (TPO): Ms. Edie Allison

REPORTING PERIOD: 1 October 1993 to 31 December 1993

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QUARTERLY TECHNICAL PROGRESS REPORT

1 October 1993 - 31 December 1993

A. OBJECTIVES

Sierra Energy Company's targeted goals during this period of the Cooperative Agreement included the following objectives from the Statement of Work: in Phase 2A, completion of Subtask 2.1.4 - Interpret data, of Task 2.1 - Acquire 3-D seismic data; and, in Phase 2B, completion of Subtask 2.2.1 - Solicit bids and award, and initiation of Subtask 2.2.2 - Acquire cores, of Task 2.2 - Drill slant hole.

TASK 2.1 - ACQUIRE 3-D SEISMIC DATA

Subtask 2.1.4 - Interpret data: The goal of this subtask was to interpret the 3-D seismic data, using a workstation, in order to locate the surface and subsurface positions for the slant and horizontal wellbores.

TASK 2.2 - DRILL SLANT HOLE

Subtask 2.2.1 - Solicit bids and award: The goal of this task is to solicit bids for the drilling and completion of the slant and horizontal wellbores, culminating in the selection of and awarding contracts to the various service companies required for the drilling of the wellbores.

Subtask 2.2.2 - Acquire cores: The goal of this task is to spud the slant/horizontal well, and begin drilling operations in preparation to core the three sandstone benches of the Frontier Formation.

B. SUMMARY OF TECHNICAL PROGRESS

TASK 2.1 - ACQUIRE 3-D SEISMIC DATA

Subtask 2.1.4 - Interpret data: Interpretation of the 3-D seismic survey was completed on a Sun Sparcstation10 workstation (UNIX based), using Landmark Graphics latest version of Seisworks 3D software. After tying the formation tops to the seismic reflectors, normal and reverse faults seen on the survey were picked to constrain the productive structure. Then, the following reflectors were picked on a 10 by 10 (inline by

crossline) grid: 1) Eagle Ss. Mbr. of the Mesaverde Fm., 2) Cody marker, 3) Frontier Fm., 4) 2nd Frontier sand, 5) 3rd Frontier sand, 6) Lakota Fm. (the Pryor Cgl. equivalent). An autopicking routine ("ZapIII") was used to fill in the picks throughout the remainder of the survey for the three Frontier reflectors. Each crossline (NW - SE orientation) within the productive area of the field was then checked for quality of the auto picking, and edited. The crossline orientation was chosen because it is optimally placed for identification of the normal faulting, which is believed to be key to well productivity. Subsequently, time-structure maps and amplitude maps were constructed for the three Frontier reflectors. Location and wellbore paths were chosen for the slant and horizontal legs. A velocity function, converting time to depth, was used to make a depth-structure map for the slant and horizontal wellbores.

TASK 2.2 - DRILL SLANT HOLE

Subtask 2.2.1 - Solicit bids and award: Various service companies, including drilling contractors, wellsite geologists, mudloggers, core-analysis companies, etc., were contacted and requested to supply bids for their anticipated services. Bids were received for various services. Sierra was prepared to award contracts for these services. However, due to the fact that Sierra entered into an agreement to sell the Badger Basin property, the drilling phase was put on hold.

Subtask 2.2.2 - Acquire cores: Sierra had picked a location and prepared a drilling plan for the slant/horizontal wellbores. Sierra was ready to submit an Application for Permit to Drill. However, due to the fact that Sierra entered into an agreement to sell the Badger Basin property, the drilling phase was put on hold.

C. REFERENCES/PUBLICATIONS

None.

D. ATTACHMENTS

Figures

- No. 1 - Time-Structure Map for the top of the Frontier Formation
- No. 2 - Depth-Structure Map for the top of the 2nd Frontier Sand
- No. 3 - Time-Structure Map for the top of the 3rd Frontier Sand

FIGURE No. 1
TIME-STRUCTURE: FRONTIER Fm.
BADGER BASIN
Park County, Wyoming

C.I. = 6 ms (approx. 30 ft.) Horizontal Scale: 1" = 2,000'

JPW 11/12/93 (Based on 3D seismic data)

Note: bottomhole location for the #3 BBFU well is an estimated position, based of expected dip, corrected by the well and absence of any normal-fault cut in the Cret. Shale or Frontier Fm.

FIGURE No. 3

TIME-STRUCTURE: 3rd FRONTIER Sd.

BADGER BASIN

Park County, Wyoming

C.I. = 6 ms (approx. 30 ft.) Horizontal Scale: 1" = 2,000'

JPW 11/12/93 (Based on 3D seismic data)

Note: bottomhole location for the #3 BBFU well is an estimated position, based of expected dip penetrated by the well and absence of any normal-fault cut in the Cody Shale or Frontier Fm.

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