

**OIL AND GAS DOCKET NO. 03-0224328**

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**THE APPLICATION OF MITCHELL ENERGY CORPORATION FOR INCREASED NET GAS OIL RATIO AUTHORITY FOR THE LAKE CREEK (WILCOX CONSOLIDATED) FIELD, MONTGOMERY COUNTY, TEXAS**

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**Heard by:** Margaret Allen, Technical Hearings Examiner

**Procedural history**

Application received: March 10, 2000

Hearing held: May 18, and June 21, 2000

**Appearances**

Mark Stephenson

Marianne Chambers Fox

Representing

Mitchell Energy Corporation

**EXAMINER'S REPORT AND RECOMMENDATION**

**STATEMENT OF THE CASE**

Mitchell Energy initially requested increased net gas/oil ratio authority, with a daily gas limit of 1500 MCF, for all wells in the Lake Creek (Wilcox Consolidated) Field, Montgomery County, Texas. Mitchell also requested that the overproduction for its King "B" Lease Well No. 1 be canceled. On May 18, evidence was presented on only two deep wells, the King "B" Lease Well Nos. 1 and 2. The hearing was recessed so that Mitchell could gather evidence on additional wells to show that the requested increase in gas/oil ratio was necessary for the field as a whole. A further hearing was held June 21, and Mitchell late-filed the final exhibits July 13, 2000.

The examiner recommends an unlimited gas/oil ratio and Mitchell concurs.

**DISCUSSION OF THE EVIDENCE**

The Lake Creek (Wilcox Consolidated) Field was formed in 1995, with the consolidation of various Lake Creek area reservoirs within the Wilcox Formation referred to by the following designations: A, B, C, D, 9500, D-9, E, F, G and H. In 1999, additional Wilcox reservoirs designated as the FB-A, E and G, in the Lake Creek, East Field, were added to the Lake Creek (Wilcox Consolidated) Field. The designated interval for the consolidated field extends from 9281 to 12,020 feet as shown on the log of the Lake Creek Unit Well No. 38. The Commission's proration schedule for February indicates 51 active gas wells and 6 active oil wells, all operated by Mitchell. There is one shut-in oil well operated by Badger Energy, Inc., who waived any objection

to this application.

Mitchell's King "B" Lease Well No. 1 was completed in 1988, in the G interval (between 11580 and 11792 feet) at a gas rate of 1804 MCF per day with 84 barrels of light-colored condensate. After producing 410 MMCF and 10,000 BC, the G interval was isolated and the applicant perforated the E and F intervals (between 11185 and 11348 feet) on July 12, 1999. The recompleted well was classified as an oil well as it produced 66 barrels of brown oil with a gravity of 44 degrees API and 627 MCF/D.

In October, 1999, Mitchell commingled the E, F and G in the King "B" No. 1 and the combined production still met the criteria to be classified as an oil well. Produced liquids appear to be a blend of condensate and oil with intermediate gravity. The gas/oil ratio has increased from 25,569 to 44,397 MCF per barrel of liquid as gas production increased to 1500 MCF per day. Well No. 1 has accumulated 2378 barrels and 150 MMCF of overproduction and would have to be shut in over 8 months to make up this overproduction.

In 1999, the King "B" Well No. 2 was drilled about 2000 feet from Well No. 1. The overall Wilcox E, F and G intervals are correlative in both wells, but the various productive sandstones do not appear continuous between these wells. Separate tests on the G and E intervals in Well No. 2 indicated similar gas/oil ratios of 32,000 and both intervals produced dark straw colored condensate of 51.4 degree gravity.

The current oil allowable is 287 barrels per day with a daily gas limit of 574 MCF. Choking back Well No. 1 to stay within its allowable causes it to load with liquids and the well must then be produced on gas lift. Allowing unlimited gas production from this oil well will provide natural gas lift. The subject field is located near The Woodlands, a rapidly-growing suburb of Houston. If this application to cancel Well No. 1's overproduction is denied, the less-prolific E oil completion will be shut-in until the G gas completion is depleted. This would prolong the length of time it will take to deplete the field and cause waste by increasing the economic limit of the various reservoirs.

Well Nos. 1 and 2 on the King "B" Lease are completed only in the E, F and/or G sands below 11,000 feet. Most wells completed between 1940 and 1995 in the current designated interval, produced gas with associated condensate from the C and D sands between 9900 and 10,500 feet. At the first hearing on May 18, 2000, no evidence was presented that wells completed in sands shallower than the E sand needed increased gas/oil limits. Also, no evidence was presented from Mitchell's Lake Creek Unit where almost all of the other active wells in the field are located. Most of the wells on the Lake Creek Unit wells are classified as gas wells which would not benefit from an increased gas/oil ratio.

Mitchell is beginning to actively recomplete wells and drill new ones within the unit, and did provide information on some of these wells at the June hearing. Despite the long history of lower Wilcox production on the unit, significant amount of hydrocarbons are being found by the new completions. Some of the older wells produced as much as 7 or 8 BCF and 500,000 BO from single sand completions in the C or D sands, with gas/oil ratios generally about 20,000.

The classification of field wells as gas or oil is based on factors such as liquid color and gravity, in addition to the gas/oil ratio. Most of the new completions are classified overall as gas wells but some of the perforated sands are definitely oil-bearing. Also wells perforated in multiple sands such as these can change from gas to oil classification and back depending on the changing producing rates from the various sandstones.

For example, the LCU Well No. 46 was completed in the D1, D2, D3 and E zones, in 1996, and is classified as a gas well. Separates tests at that time however, showed that the D3 sand is oil-bearing since its tested production was 24 BOPD with no gas. The fluids in the other sands, the D1, D2 and E sands, are heterogeneous with gas/oil ratios from 7700 to 26,000 and tested daily gas rates from 154 to 1084 MCF. Another unit well, No. 81, was recompleted in the Wilcox C2, D1, D2 and D3 zones, in 2000, and is producing 1672 MCF with a gas/oil ratio of 12,539. However, due to the fluid analyses, this well is now classified as an oil well by the Commission.

Several other unit wells have unperforated pay in the C and D intervals and it is apparent that some pay sands are present in only one well. Mitchell believes that the designated Wilcox interval contains numerous small, lenticular sandstone reservoirs of limited areal extent. It is not possible to predict whether a particular sandstone will be gas-bearing or oil-bearing before it is perforated. These sandstones all have very low permeability and massive fracture stimulations are required. Producing each small sandstone individually would not be economic in these deep wells. Limiting gas production, based on the oil allowable and a gas/oil ratio of 2000/1, from a completion with multiple sets of perforations will not protect the oil production in an individual reservoir and will not prevent waste. The gas allocation formula is now suspended and there is no allowable reason to limit the gas production from the wells now classified as oil.

#### **FINDINGS OF FACT**

1. Notice of this hearing was issued to operators of record in the Lake Creek (Wilcox Consolidated) Field on April 14, 2000.
2. Notice of this application was mailed to Badger Energy, Inc., on June 20, 2000.
3. The Lake Creek (Wilcox Consolidated) Field was formed in 1995, with the consolidation of Lake Creek Wilcox reservoirs designated as A, B, C, D, 9500, D-9, E, F, G and H; and the Lake Creek, East Wilcox reservoirs designated as FB-A, E and G.
4. The designated interval for the consolidated field extends from 9281 to 12,020 feet and contains numerous low permeability Wilcox sands most of which have limited areal extent.
5. Some of the older wells, drilled in the 1940's and 1950's, produced as much as 7 or 8 BCF and 500,000 BO from single sand completions in the C or D sands, and generally had gas/oil ratios about 20,000 cubic feet per barrel.
6. Mitchell is beginning to actively recomplete wells and drill new ones that are perforated in numerous sands some of which are oil-bearing and others gas-bearing.

7. Most of the new completions are classified as gas wells but some tested sands are oil-bearing and wells can be reclassified from gas to oil and back, depending on the changing producing rates from the various commingled sandstones.
8. The classification of wells as gas or oil is based on factors in addition to the gas/oil ratio, and some of the new wells have been classified as oil even though their gas/oil ratios are little different from those of the gas wells.
9. It is not possible to predict whether a sandstone will be oil-bearing or gas-bearing before it is perforated.
10. These low permeability sandstones require massive fracture stimulations and producing each small sandstone individually would not be economic in these deep wells.
11. All the gas wells can produce at their maximum capability and restricting the gas production from wells currently classified as oil will not prevent waste.
12. Higher gas rates can provide natural gas lift to the wells currently classified as oil and there is no reason to require wells be shut in to make up overproduction.

**CONCLUSIONS OF LAW**

1. Proper notice was given as required by statute.
2. All things have been done or occurred to give the Railroad Commission jurisdiction to resolve this matter.
3. Granting increased gas oil ratio authority will prevent waste and protect correlative rights.

**EXAMINER'S RECOMMENDATION**

Based on the above findings and conclusions, the examiner recommends that net gas/oil ratio authority, with an unlimited gas limit, be approved for the Lake Creek (Wilcox Consolidated) Field. All overproduction for oil wells in this field should also be canceled.

Respectfully submitted,

Margaret Allen  
Technical Hearings Examiner

Date of Commission Action: August 8, 2000

Exhibits

1. Map of King Lease
  2. Proration schedule
  3. Map of Cross sections
  4. Cross section
  5. Fluid analysis
  6. King Well B-1 monthly production graph
  7. Tabulation of 6
  8. Overproduction
  9. Market letter
  10. Wellbore schematic of King B1
  11. Cross section of shallower zones
- LF-1 Cross section index map
- LF-2 Cross section A-A' showing shallower sands
- LF-3 LCU Well 81 production
- LF-4 LCU Well 46 production
- LF-5 Production for various wells in upper part of section