

June 15, 2000

OIL AND GAS DOCKET NO. 7C-0224845

THE APPLICATION OF OCCIDENTAL PERMIAN LTD. TO AMEND FIELD RULES IN THE JM (ELLENBURGER) FIELD, CROCKETT AND VAL VERDE COUNTIES, TEXAS

Heard by: Margaret Allen, Technical Hearings Examiner

Procedural history

Application received: May 10, 2000

Hearing held: June 14, 2000

Appearances

John Soule

Thomas Lee Norris

Representing

Occidental Permian Ltd.

EXAMINER'S REPORT AND RECOMMENDATION

STATEMENT OF THE CASE

The existing rules for the JM (Ellenburger) Field were adopted June 13, 1966, under Docket No. 7C-56465, as amended, and are summarized as follows:

1. 1867-3000 foot well spacing;
2. 640 acres with a maximum diagonal of 11,500 feet;
3. allocation based on acreage; and
4. surface casing rule.

Occidental seeks the following amended rules:

1. Designated interval from 12,186 to 13,620 feet as shown on the log of the Shell Oil Company (now Occidental Permian) Mitchell Well No. 1
2. 660-1320 foot well spacing;
3. 640 acres proration units with a maximum diagonal of 11,500 feet and 320 acre optional units with the same diagonal; and
4. Allocation based 5% on acreage and 95% on deliverability.

DISCUSSION OF THE EVIDENCE

The JM (Ellenburger) Field was discovered in May of 1965 with the completion of the Shell Oil Mitchell Well No. 1. The field has been developed with wells located on 640 acre proration units, and has been most recently operated by Altura. Occidental Permian has recently purchased Altura's interests and intends to do infill drilling.

Occidental operates 25 of the 27 wells in the field which has already had 565 BCF of cumulative production. The gross reservoir thickness is 1500 feet with 100 to 300 feet of net pay in most wells. The reservoir is extremely heterogenous and permeability ranges from 0.02 md in matrix rock to very high in fractures and cave breccias. The gas produced is 20 to 35% CO₂ and original reservoir pressure was 6630 psi.

The discovery well, the Mitchell No. 1, has produced 115 BCF and is still producing about 5600 MCF per day. The Mitchell No. 2 had an initial daily producing rate of 40,000 MCF and its current rate is 5100 MCF per day. Well No. 2's producing rate decline has been about 7% and its cumulative production since 1966 has been 165 BCF. Other wells have produced much less than the best wells but are still highly successful gas wells. For example, the Mitchell No. 6 has produced 'only' 33 BCF since 1966. This well's initial daily deliverability was 2000 MCF and it is still producing about 800 MCF per day, indicating a very slow decline in producing rate.

In 1995, Shell, the original operator, drilled an infill well between two wells that were about a mile apart. This infill well began production at 1800 MCF per day and has already produced 9 BCF. This well, the Mitchell No. 21, was drilled with gas, allowing accurate estimates of the production rates from the different porosity lenses. During drilling, 2600 MCF per day flowed from a porous lens in the middle of the Ellenburger and 18,500 MCF per day flowed from a lens near the bottom of the section. This is an indication to Occidental that there is significant vertical heterogeneity.

The bottom-hole pressure has declined at different rates in different parts of the field indicating lateral reservoir compartmentalization. Occidental has conducted 3d seismic over the field and believes that new technology will allow it to drill reservoir compartments that have not been drained.

The field is located in the Ellenburger Formation, near the toe of a major thrust fault. The overriding Ellenburger has been broken by various normal faults that increase in number near the toe of the thrust. Fracturing is assumed to have increase porosity and permeability though wells in the more fractured part of the formation have been poorer producers than those farther from the edge of the thrust. This may be related to the lower structural elevation closer to the toe of the thrust block.

Even before faulting, the Ellenburger Formation was extremely heterogenous having been subjected to karst erosion after deposition. Solution enlarged fractures, sink holes and cavernous porosity developed. By the time the Strawn was deposited on top of the Ellenburger, the caverns had

collapsed and filled with breccia that still has very high porosity and permeability. Formation imaging logs, which can be used to differentiate bedded dolomite, fractured sections and cave breccia, should help in further development.

A few beds are laterally extensive and wells completed in them may be able to drain large areas. The reservoir heterogeneity makes it impossible to estimate the drainage radii or the reserves in a specific reservoir volume. Volumetric calculations are also hampered because almost all the wells were drilled in the 1960's and log suites of this age do not contain usable porosity data. If the infill wells on 320 acres are successful, the operator will consider reducing the density of drilling further.

The operator is requesting well spacing of 660-1320 feet because the difficulty locating wells around the faults. In addition, the terrain is rugged, with 500 to 600 feet of elevation difference across the canyons. Well locations are limited to flatter areas. Using the same maximum diagonal of 11,500 feet for wells on 320-acre units will also increase flexibility in the location of infill wells.

The applicant is requesting a two-factor allocation formula because of the multiple reservoirs in the Ellenburger section. One based mostly on deliverability is appropriate since the number of acres assigned may not reflect the area being drained. The applicant requested that the entire Ellenburger section in the discovery well be considered the designated interval for the field. The applicant also suggested that the casing rule be rescinded since it is no longer in effect.

FINDINGS OF FACT

1. Notice of this hearing was given to all operators in the JM (Ellenburger) Field on May 19, 2000.
2. The JM (Ellenburger) Field was discovered in 1965, with the completion of the Shell Oil Mitchell Lease Well No. 1.
3. There are 27 wells in the field, which has produced almost 0.5 TCF, and many of the original wells are still producing a million cubic feet or more every day.
4. The field has been developed on 640 acre units but an infill well drilled in 1995 had a high initial potential and has already produced 9 BCF.
5. The reservoir is extremely heterogeneous, with great variations in porosity and permeability that make determination of volumetric reserves and drainage areas impossible.
 - a. The field is located on the overriding plate of a thrust fault that has been broken by numerous normal faults.
 - b. The Ellenburger Formation developed extensive karsting after deposition, resulting in many fractures, caves, cave breccias and sink holes.
6. Some of the porous lenses appear to be laterally extensive but many lenses are found in only one well.

7. The rates of pressure depletion and production decline are not consistent throughout the field, again indicating reservoir compartmentalization.
8. Well spacing of 660-1320 feet will allow wells to be located around faults and on the more level spots in this canyon country.
9. Retaining the diagonal of 11,500 feet for optional wells will add flexibility in locating infill wells.
10. Because of the multiple reservoirs a two-factor allocation formula is necessary for statutory reasons.
11. One based largely on deliverability is appropriate since the number of acres drained by each well cannot be estimated.
12. Porosity lenses have been located throughout the Ellenburger section whose top and base are at 12,186 and 13,620 feet in the discovery well.

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. The requested amendments to the field rules for the JM (Ellenburger) Field will prevent waste, protect correlative rights within the field, and provide for orderly development of the field.

EXAMINER'S RECOMMENDATION

Based on the above findings and conclusions, the examiner recommends that the existing rules for the JM (Ellenburger) Field be amended as requested.

Respectfully submitted,

Margaret Allen
Technical Hearings Examiner

Date of Commission action: July 11, 2000.

Exhibits

1. Location map
2. Proration schedule
3. Field rule order
4. Field map
5. Topographic map
6. Cross section
7. Type log
8. Geologic model
9. Reservoir data sheet
10. Production tabulations
11. Decline curves from three wells
12. Rules from other Ellenburger fields