

RULE 37 CASE NO. 0246122
District 03

**APPLICATION OF ANADARKO E & P COMPANY LP FOR AN EXCEPTION TO
STATEWIDE RULE 37 TO DRILL ITS CALVIN BOECKER UNIT, WELL NO. 2,
GIDDINGS (AUSTIN CHALK, GAS) AND GIDDINGS (AUSTIN CHALK-3) FIELDS,
AUSTIN COUNTY, TEXAS**

APPEARANCES:

FOR APPLICANT:

Ana Maria Marsland-Griffith
Philip LeMay
David Christian
Deborah Hawthorne

APPLICANT:

Anadarko E & P Company LP

FOR PROTESTANTS:

Joseph H. Perino
Sadie Perino
Alfred Krause
Joyce Krause

PROTESTANTS:

Same

PROPOSAL FOR DECISION

PROCEDURAL HISTORY

DATE APPLICATION FILED:

February 1, 2006

DATE OF NOTICE OF HEARING:

March 10, 2006

DATE OF HEARING:

April 19, 2006

HEARD BY:

James M. Doherty, Hearings
Examiner

Thomas H. Richter, Technical Examiner

DATE TRANSCRIPT RECEIVED:

May 2, 2006

DATE PFD CIRCULATED:

May 15, 2006

STATEMENT OF THE CASE

Anadarko E & P Company LP (“Anadarko”) requests an exception to Statewide Rule 37 to drill Well No. 2 (“proposed well”) on its 732.97 acre Calvin Boecker Unit (“Boecker Unit”) in the Giddings (Austin Chalk, Gas) and Giddings (Austin Chalk-3) Fields (“subject fields”), Austin County, Texas. The proposed well will be a second horizontal well on the Boecker unit. A plat showing the proposed well location is attached to this proposal for decision as Appendix 1. The subject fields have 467'/1200' well spacing. A Rule 37 lease line exception is needed because the terminus of the proposed horizontal well is 50' from the northwest pooled unit boundary and the penetration point and a portion of the horizontal drainhole are closer than 467' to the southwestern boundary of the pooled unit. A Rule 37 between well exception is needed because the surface and penetration point locations of the proposed well are 594.50' from the terminus of the up dip lateral of the Calvin Boecker Unit, Well No. 1 which is completed in the Giddings (Austin Chalk, Gas) Field.

The application is protested by Joseph H. and Sadie Perino and Alfred and Joyce Krause. The Perinos are mineral owners of an unleased tract contiguous to the Boecker Unit on the northwest, and the Krauses are mineral owners of an unleased tract contiguous to the Boecker Unit on the north.

POSITIONS OF THE PARTIES

Anadarko asserts that the Austin Chalk is highly fractured and that porosity and permeability in the reservoir results mainly from naturally occurring vertical fracturing. There is a salt dome feature to the west of the Boecker unit, and Anadarko believes that there is more fracturing and faulting along the western side of its unit, where the proposed well will be drilled, than to the east. Anadarko argues that the proposed well is necessary to give Anadarko an opportunity to recover its fair share of reserves and that the proposed well will recover reserves that cannot be recovered by any other well. Accordingly, Anadarko believes that the requested Rule 37 exception is necessary to prevent confiscation and waste of hydrocarbons.

The protestants are concerned primarily with the fact that although they own unleased mineral interests in tracts immediately adjacent to the Boecker unit, Anadarko has not elected to include their tracts in the unit. The protestants' tracts are surrounded by other lease tracts or pooled units and probably are not large enough to allow drilling of a viable horizontal well. Protestants are concerned with possible drainage of fractures extending onto their tracts and believe that the fair thing for Anadarko to do is to include their tracts in the Boecker unit so that protestants can participate in production from wells drilled on the unit.

DISCUSSION OF THE EVIDENCE

Anadarko

The Austin Chalk was first developed by the drilling of vertical wells, until geologists determined that the reservoir was highly fractured. Porosity and permeability in the reservoir is due mainly to fractures, and production is obtained from these fractures. Drilling of horizontal wells is necessary to intersect fractures and produce oil or gas from them.

The 732.97 acre Boecker Unit is located in the Hodge, J. Survey, A-49, and is partly in Austin County and partly in Washington County. There is an existing horizontal well on the southern half of the Unit, the Boecker #1. The Boecker #1 has down dip and up dip laterals, and the terminus of the up dip lateral is 594.5' from the proposed surface and penetration point locations of the Boecker #2. The proposed Boecker #2 will have a single up dip lateral extending about 4,172' to the north from the proposed surface location. This well will exploit the northern half of the Boecker Unit, which Anadarko believes has not yet been exploited. The proposed terminus of the Boecker #2 is 50' from the northwest Unit boundary. The proposed surface and penetration point locations of the Boecker #2 are 179.6' from the southwest boundary of the Unit, and portions of the proposed lateral are less than 467', as close as 100' at one location, to the southwest boundary.

The Austin Chalk is fairly consistent and continuous across the area of the Boecker Unit, as shown by an Anadarko west to east cross section, from the Goldberg #1 on the west, to the Boecker Unit #1, and to the Rains Trust #2 on the east. In this area, the Austin Chalk is 300'-400' thick. About 1.5 miles to the west of the Boecker unit is a salt dome feature. According to Anadarko's geologist, there are several salt domes that affect the Austin Chalk, four of which are in the deep Giddings trend. As a salt dome forms, it causes surrounding rock to bend and stress, causing faults and fractures. Faulting and fracturing increases with proximity to the salt dome. Anadarko's geologist believes this is demonstrated by schematic fault interpretations for the Goldberg Unit #2, located to the southwest of the proposed Boecker #2 about 9,300' from the salt dome to the west, and the Mill Creek #1H, located northeast of the proposed Boecker #2 about 13,400' from the salt dome. These interpretations, prepared from gamma ray data obtained while drilling and correlation with offset wells, show that the Goldberg Unit #2 encountered five faults while drilling, whereas the Mill Creek #1H encountered only one fault. There is more fracturing in the reservoir with the greater number of faults.

The Goldberg Unit #2 is a better well than the Mill Creek #1H, and Anadarko's geologist attributes this to the well's closer proximity to the salt dome, where fracturing in the reservoir is greater. Anadarko's reservoir engineer used production curves to estimate ultimate recovery for the Goldberg Unit #2 of 3.6 BCF or about 605,000 barrels of oil equivalent ("BOE") as compared to ultimate recovery for the Mill Creek #1H of 53,000 BOE. The proposed lateral of the Boecker #2 is located close to the western side of the Boecker Unit to get it closer to the salt dome to the west, and it is expected that this well will encounter a greater number of fractures than a well that might be drilled on the eastern side of the Unit.

The Austin Chalk has been extensively studied, and the relevant literature suggests that fracture orientation in the Austin Chalk is anywhere from 20 -25 degrees off horizontal. Anadarko's reservoir engineer believes that fracture orientation on the Boecker Unit and in surrounding areas is about 25 degrees off horizontal. A base map of the area around the Boecker Unit shows generally that horizontal wells in the area have been drilled perpendicular to the line of fracture orientation. According to Anadarko's reservoir engineer, it is standard practice to drill horizontal laterals perpendicular to the fracture orientation, with a goal to intersect as many fractures as possible.

In a fractured reservoir, it is generally not possible to calculate reserves by any conventional methodology. In such a reservoir, reliance must be had on production data to make reserve estimates, and Anadarko has found this method to be reliable. Since horizontal laterals traverse fractures from which oil or gas is produced, the length of the lateral is directly related to the amount of reserves that will be recovered.

Production curves and estimates of ultimate recovery prepared by Anadarko's reservoir engineer for horizontal wells in the area of the Boecker Unit, and a log probability chart, demonstrate that about half of the wells will produce more than 113 BOE per foot and half will produce less than that number. Nonetheless, for the purpose of his reserve estimate, Anadarko's reservoir engineer used a more conservative number, the EUR for the Boecker #1 of 72 BOE per foot. A line drawn across the length of the Boecker Unit from the northwest to the southeast measures 9,800'. Thus, by multiplying 9,800' by 72 BOE, Anadarko's reservoir engineer estimates 706 MBOE of original recoverable reserves for the Unit. Of this amount, the Boecker #1 has an EUR of 346 MBOE, about 90% of which has already been recovered. This leaves remaining recoverable reserves for the proposed Boecker #2 of about 360 MBOE.

Anadarko's reservoir engineer does not believe that the Boecker #1 is capable of recovering the 360 MBOE of remaining reserves targeted by the proposed Boecker #2, because the Boecker #1 traverses only the southern half of the Boecker Unit and cannot drain any fractures north and west of the terminus of its up dip lateral. Anadarko's reservoir engineer also has the opinion that there are no other existing wells capable of draining the northern half of the Unit.

Drilling a well at a regular location on the Boecker Unit to recover the 360 MBOE of remaining recoverable reserves under the Unit would not be feasible for several reasons. Anadarko's reservoir engineer estimates that the lateral of such a regularly located well would be only about 3,000' long, 1,300' less than the proposed Boecker #2. The location of the up dip lateral of the Boecker #1 would prevent placing the surface and penetration point at a regular location as far south as would be needed to achieve greater lateral length, because then the lateral would overlap the up dip lateral of the Boecker #1 and complicate the drilling of the well. If, for example, the well encountered fractures depleted by the up dip lateral of the Boecker #1, returns would be lost and it would not be possible to circulate the wellbore. Should cuttings stack up at the curve of the wellbore where it goes from vertical to horizontal, sticking of the drill pipe would be a possibility. Furthermore, a regularly located well would have to be further east on the Boecker Unit and thus further away from the salt dome to the west, decreasing the likelihood of intersecting the maximum number of fractures. Also, a well at a regular location would have to be drilled less perpendicular to the fracture orientation. The Boecker #1 is already drilled slightly off perpendicular and is a low performing well in relation to other area wells.

At an assumed EUR of 72 BOE per foot, the proposed Boecker #2 will recover about 94 MBOE more in reserves than a well at a regular location on the Boecker Unit with a 3,000' lateral. In the opinion of Anadarko's reservoir engineer, no well at a regular location on or off the Boecker Unit could recover this 94 MBOE. A recovery of about 300 MBOE is required to justify drilling of a horizontal well in the Austin Chalk, and no prudent operator would drill such a well to recover 94 MBOE. In the opinion of Anadarko's reservoir engineer, drilling of the Boecker #2 at the proposed location is necessary to prevent the waste of hydrocarbons and to afford Anadarko an opportunity to recover its fair share of hydrocarbons from the reservoir.

Protestants

The Perinos are owners of the minerals in an unleased tract adjoining the Boecker Unit on the northwest.¹ The Perinos have owned this tract for many years and had expected that royalties on oil or gas production from the tract would help support them in their retirement. The Perinos at one time leased their tract to another operator, but no well was ever drilled there, and the lease expired. In the meantime, Anadarko and other operators formed units and drilled wells around the Perinos' tract. The Perinos have discussed with Anadarko the possibility of including their tract in the Boecker Unit or nearby Goldberg Unit, but Anadarko has not elected to do so.

The Perinos obtained the opinion of a consulting petroleum engineer that their tract had not been drained by any of the surrounding wells, and that a feasible horizontal well could be drilled across the Perinos' tract and tracts to the south and north, if an operator willing to lease these tracts and drill such a well could be found. The Perinos also consulted with another operator about the feasibility of drilling a horizontal well on the Perinos' tract and the Klatt tract to the north, but this operator advised that the lateral would not be long enough to justify drilling the well.

The Perinos believe that their tract is now pinned in by surrounding units and leases and that well economics apparently prevent a well from being drilled on their tract in the present circumstances. The proposed Boecker #2 may drain fractures extending onto the Perinos' tract, and the Perinos suggest that the fair thing for Anadarko to do is include the Perinos' tract in the Boecker Unit or propose some other solution that will enable the Perinos to recover their fair share of hydrocarbons from the reservoir.

The Krauses take essentially the same position as the Perinos. They are the owners of the minerals in an unleased tract adjoining the Boecker Unit on the north.² The main reason for the Krauses' protest is their concern that Anadarko included in the Unit tracts owned by Krause relatives that are near the Krauses' tract, but for unknown reasons did not include the Krause tract. Ms. Krause asserted that Anadarko advised that at least 1.24 acres owned by the Krauses would be included in the Boecker Unit, but the Krauses have not been paid any royalty attributable to this acreage.

¹ Anadarko estimated that the terminus of the proposed Boecker #2 lateral is about 400' from the closest point on the Perinos' tract.

² Anadarko estimated that the distance from the Krauses' tract to the nearest point on the lateral of the proposed Boecker #2 is about 1,500'.

EXAMINERS' OPINION

Anadarko contends that the granting of a Rule 37 exception for the proposed Boecker #2 is necessary to prevent confiscation and waste of hydrocarbons. An owner of oil and gas is entitled to an opportunity to recover the reserves underlying his tract, and any denial of that opportunity amounts to confiscation. *Atlantic Refining Co. v. Railroad Commission*, 346 S.W.2d 801 (Tex. 1961); *Imperial American Resources Fund, Inc. v. Railroad Commission*, 557 S.W.2d 280 (Tex. 1977). When the subject tract is capable of supporting a regular location, the applicant for a Rule 37 exception based on confiscation must prove that the proposed irregular location is necessary because of surface or subsurface conditions and that the proposed location is reasonable. To do this, the applicant must show that it is not feasible to recover its fair share of hydrocarbons from regular locations.

In addition, if a substantial amount of hydrocarbons will be produced by the proposed Rule 37 well that otherwise would ultimately be lost, a permit to drill the well may be justified to prevent waste. *Hawkins v. Texas Co.*, 209 S.W.2d 338, 343 (Tex. 1948). An applicant seeking an exception to Rule 37 based on waste must show that: (1) unusual conditions, different from conditions in adjacent parts of the field, exist under the tract for which the exception is sought; and (2) as a result of these unusual conditions, hydrocarbons will be recovered by the well for which the exception is sought that would not be recovered by any existing well or by an additional well drilled at a regular location; and (3) the amount of otherwise unrecoverable hydrocarbons is substantial.

The examiners believe that Anadarko has proved that the requested Rule 37 exception is necessary to prevent confiscation. Current recoverable reserves under the Boecker Unit are about 360 MBOE. The existing Boecker #1 on the Unit is not capable of recovering these reserves because its laterals are on the southern half of the Unit and will not drain fractures to the north and west of the Boecker #1 up dip lateral. Anadarko's evidence also condemns the capability of a well at a regular location on the Boecker Unit to recover these reserves. To fit a well at a regular location on the Unit, a lateral of only about 3,000' could be drilled, and because of this short lateral, the regularly located well could recover only about 216 MBOE, even if it were equally as productive as the Boecker #1. Whether a well at a regular location would be this productive is in doubt, because: (1) the well would need to be drilled toward the eastern side of the Unit, further away from the salt dome to the west, where there may be diminished fracturing; and (2) the well could not be drilled truly perpendicular to the fracture orientation. Because of its short lateral, even if a well at a regular location on the Unit were as productive as the Boecker #1, the well likely would recover about 94 MBOE less than the expected recovery of the proposed Boecker #2. There is no other regular location on the Unit for a third well to recover this 94 MBOE. The granting of a Rule 37 exception for the drilling of the proposed Boecker #2 is necessary to afford Anadarko an opportunity to recover its fair share of hydrocarbons from the reservoir.

The examiners believe that the proposed location is reasonable because: (1) it is necessary to drill as near to the salt dome to the west of the Boecker Unit as is reasonable in order to intersect the greatest number of productive fractures in the reservoir; (2) the proposed location is necessary to drill as nearly perpendicular to the fracture orientation as is possible; and (3) the proposed location is necessary to achieve a lateral of sufficient length to afford Anadarko an opportunity to recover its fair share of hydrocarbons.

While the concerns expressed by the protestants may be justified, the Commission has no authority, in the context of this Rule 37 case, to order Anadarko to include protestants' tracts within the Boecker Unit or to impose such a requirement as a condition of approval of the requested Rule 37 exception.³

Based on the record in this case, the examiners recommend adoption of the following Findings of Fact and Conclusions of Law.

FINDINGS OF FACT

1. At least ten (10) days notice was provided to all persons affected by this application.
2. Anadarko E & P Company LP ("Anadarko") requests an exception to Statewide Rule 37 to drill its Calvin Boecker Unit ("Boecker Unit"), Well No. 2 ("Boecker #2"), in the Giddings (Austin Chalk, Gas) and Giddings (Austin Chalk-3) Fields ("subject fields"), Austin County, Texas.
3. The Anadarko application is opposed by Joseph H. and Sadie Perino, owners of the minerals in an unleased tract that borders the Boecker Unit on the northwest, and Alfred and Joyce Krause, owners of the minerals in an unleased tract that borders the Boecker Unit on the north.
4. The subject fields have special field rules providing for 467' lease line and 1,200' between well spacing.
5. Anadarko proposes to drill the Boecker #2 as a second horizontal well on the 732.97 acre Calvin Boecker Unit. A plat of the Unit and surrounding area, showing the location of the existing Boecker #1 and the proposed location of the Boecker #2, is attached as Appendix 1 and incorporated into this finding by reference.
6. The existing Boecker #1 is drilled on roughly the southern half of the Boecker Unit. Anadarko proposes to drill the Boecker #1 on the northern half of the Unit to intersect and drain fractures that have not yet been drained by any well.
7. The existing Boecker #1 has down dip and up dip laterals, and the terminus of the up dip lateral is 594.5' from the surface and penetration point locations of the proposed Boecker #2.
8. The proposed Boecker #2 will have a single lateral extending about 4,172' northwest from the surface location. The terminus of the Boecker #2 will be 50' from the northwest boundary of the Boecker Unit. The surface and penetration point locations of the Boecker #2 will be 179.6' from the southwest boundary of the Unit. Portions of the proposed lateral will be less than 467', and as close as 100' at one location, to the southwest boundary of the Unit.

³ The Commission's authority to order forced pooling is limited to the proper case brought pursuant to the Mineral Interest Pooling Act ("MIPA"). Assuming, without deciding, that protestants may have this remedy available, nonetheless they have not properly invoked the Commission's jurisdiction under the MIPA.

9. The Austin Chalk is a fractured formation, and production of oil or gas is obtained from fractures by the drilling of horizontal wells intersecting the fractures.
10. There are several salt domes that affect the Austin Chalk. As a salt dome forms, it causes surrounding rock to bend and stress, creating faults and fractures. Faulting and fracturing increases with proximity to the salt dome.
11. About 1.5 miles west of the Boecker Unit is a salt dome feature. Wells in proximity to this salt dome have encountered more faulting and fracturing than wells further away. There is more fracturing in the reservoir in areas with the greatest amount of faulting. Horizontal wells drilled near the salt dome tend to be better performing wells because they intersect and produce from multiple fracture systems.
 - a. The Goldberg #2 well located about 9,300' away from the salt dome encountered five faults while drilling.
 - b. The Mill Creek #1H well located about 13,400' from the salt dome encountered only one fault while drilling.
 - c. Estimated ultimate recovery ("EUR") for the Goldberg #2 is about 605,000 barrels of oil equivalent ("BOE").
 - d. EUR for the Mill Creek #1H is only about 53,000 BOE.
12. Anadarko proposes to drill the Boecker #2 on the western side of the Boecker Unit, as close as reasonably possible to the salt dome to the west of the Unit, with the expectation that a well at this location will intersect a greater number of fractures than a well drilled further to the east.
13. It is standard practice in the industry to drill horizontal wells in the Austin Chalk perpendicular to the line of fracture orientation in order to intersect and produce from the greatest number of fractures. In the area of the Boecker Unit, fracture orientation is northeast to southwest, about 25 degrees off horizontal, and existing horizontal wells in the area have been drilled as perpendicular to this line of fracture orientation as was reasonably possible.
14. The proposed lateral of the Boecker #2 is roughly perpendicular to the line of fracture orientation in the area.
15. Drilling of the proposed Boecker #2 at the proposed location is necessary to give Anadarko an opportunity to recover its fair share of hydrocarbons from the reservoir.
 - a. Original recoverable reserves under the Boecker Unit were about 706 MBOE.
 - b. The EUR for the Boecker #1 is 346 MBOE, about 90% of which has already been produced.

- c. Currently recoverable reserves under the Boecker Unit are about 360 MBOE.
 - d. The Boecker #1 is not capable of recovering the 360 MBOE of remaining reserves under the Boecker Unit because it traverses only the southern half of the Unit and cannot drain any fractures north and west of the terminus of its up dip lateral.
 - e. It is not feasible to drill a horizontal well at a regular location on the Boecker Unit capable of recovering the 360 MBOE of remaining reserves under the Unit.
 - i. A horizontal well drilled at a regular distance from unit boundaries and the location of the Boecker #1 under applicable spacing rules would have a lateral of only about 3,000'. The surface location of such a well could not be moved south on the Unit to lengthen the lateral because the well would then overlap the Boecker #1 and cause lost circulation in the wellbore when and if fractures depleted by the Boecker #1 were encountered while drilling.
 - ii. Based on the EUR of the Boecker #1 of about 72 BOE per foot, a well at a regular location on the Boecker Unit, having a lateral of only 3,000', would recover about 216 MBOE, or about 94 MBOE less than the proposed Boecker #2.
 - iii. A well at a regular location on the Boecker Unit would need to be drilled further to the east than the proposed Boecker Unit #1 location and would be further away from the salt dome to the west of the Unit. For this reason, it is reasonable to expect that a well at a regular location might encounter an area of lesser fracturing from which hydrocarbons could be produced.
 - iv. A well at a regular location would need to be drilled less perpendicular to the fracture orientation under the Boecker Unit. The Boecker #1 was drilled slightly off perpendicular and is a relatively low performing well. It is reasonable to expect that a well at a regular location might not intersect a sufficient number of fractures to efficiently recover the remaining reserves under the Unit.
16. The proposed location of the Boecker #2 is reasonable.
- a. At its closest point, the proposed Boecker #2 is about 400' from the Perino tract and about 1,500' from the Krause tract.
 - b. The proposed location is on the west side of the Boecker Unit, as near as reasonably possible to the salt dome to the west of the Unit, as is necessary to increase the likelihood that the well will encounter the greatest amount of fracturing in the reservoir beneath the Unit.
 - c. The proposed location is necessary to drill as nearly perpendicular to the fracture orientation under the Boecker Unit as is reasonably possible.

- d. The proposed location is necessary to drill a lateral of sufficient length to provide Anadarko an opportunity to recover its fair share of hydrocarbons.

CONCLUSIONS OF LAW

- 1. Proper notice of hearing was timely issued by the Railroad Commission to appropriate persons legally entitled to notice.
- 2. All things necessary to the Commission attaining jurisdiction over the subject matter and the parties in this hearing have been performed.
- 3. The granting of an exception to Statewide Rule 37 to Anadarko E & P Company LP to drill its Calvin Boecker Unit, Well No. 2, Giddings (Austin Chalk, Gas) and Giddings (Austin Chalk-3) Fields, Austin County, Texas, is necessary to prevent confiscation and protect correlative rights.

RECOMMENDATION

The examiners recommend that the application of Anadarko E & P Company LP for an exception to Statewide Rule 37 to drill its Calvin Boecker Unit, Well No. 2 in the Giddings (Austin Chalk, Gas) and Giddings (Austin Chalk-3) Fields, Austin County, Texas, be granted as provided in the attached Final Order.

Respectfully submitted,

James M. Doherty
Hearings Examiner

Thomas H. Richter, P.E.
Technical Examiner