

STATE OF MICHIGAN  
DEPARTMENT OF NATURAL RESOURCES

**ORDER OF THE SUPERVISOR OF WELLS**

IN THE MATTER OF

THE PETITION OF AMOCO PRODUCTION )  
COMPANY FOR AN EXCEPTION TO )  
RULE 202(a) FOR WELL LOCATION )  
REQUIREMENTS FOR ANTRIM GAS WELLS) )  
IN EIGHT COUNTIES IN THE SOUTHERN) )  
LOWER PENINSULA OF MICHIGAN ) )

ORDER NO. (A) 3-3-95

**OPINION AND ORDER**

On March 21, 1995, a contested case hearing was held before the Supervisor of Wells and the Oil and Gas Advisory Committee under authority of the Supervisor of Wells Act, 1939 PA 61, as amended, MCL 319.1 et seq.; MSA 13.139(1) et seq., and the administrative rules, 1979 AC, R 299.1101 et seq. The hearing was conducted in accordance with the Administrative Procedures Act, 1969 PA 306, as amended, MCL 24.201 et seq.; MSA 3.560 (101) et seq. The purpose of the hearing was to consider the petition of Amoco Production Company for well location exceptions and approval of alternate completion techniques for gas wells drilled into the Antrim Shale Formation in eight specified counties in Michigan. The Supervisor of Wells, on his initiative, expanded the area being considered to 34 additional counties.

**FINDINGS OF FACT**

1. Amoco Production Company (Amoco) is the operator of 31 Antrim Shale wells in eight counties in the southern lower peninsula of Michigan. I find, Amoco is a proper petitioner for the relief requested pursuant to Act 61.

2. Amoco's petition requests location exceptions in the eight counties where it has drilled Antrim Shale gas wells. The Supervisor expanded the subject matter of the hearing to include a total of 42 counties. The Supervisor expanded the area because of the uniform presence of the Antrim Shale Formation throughout this area of Michigan. See Exhibit 8. It appears likely that Antrim

Shale gas well drilling and development will continue to occur generally throughout the area. The area considered at the hearing is comprised of the following counties:

Allegan, Barry, Berrien, Branch, Calhoun, Cass, Clare, Clinton, Eaton, Genesee, Gladwin, Gratiot, Hillsdale, Huron, Ingham, Ionia, Isabella, Jackson, Kalamazoo, Kent, Lapeer, Lenawee, Livingston, Macomb, Mecosta, Midland, Montcalm, Muskegon, Newaygo, Oakland, Oceana, Osceola, Ottawa, Saginaw, Sanilac, St. Clair, St. Joseph, Shiawassee, Tuscola, Van Buren, Washtenaw, and Wayne.

3. All 31 of the wells drilled by Amoco have been located on 40-acre drilling units consisting of governmental quarter-quarter sections. The locations of such wells on the 40-acre drilling units is consistent with the requirements of Rule 201(c). These requirements are that the location of a well must be in the center of the drilling unit or in the center of one of the 10-acre quarters of the drilling unit. Pursuant to Rule 202(a), if a discovery well is located in one of the four corners of a drilling unit, then every development well within a two mile radius of the discovery well must be located on its drilling unit in the same relative corner as the discovery well. If a discovery well is located in the center of a drilling unit, Rule 202(b) requires that a hearing be conducted to determine the appropriate well spacing pattern for all development wells within a two mile radius.

4. Amoco presented the testimony of William D. Griffin, an Amoco petroleum engineer. Mr. Griffin testified the Rule 202(a) location requirements for development wells is unduly restrictive for purposes of Antrim Shale gas wells. He testified, and exhibits illustrate, the topography of the southern and central lower peninsula of Michigan is characterized by the presence of lakes, streams, drainage ditches, wetlands, and various surface improvements such as residences, farm buildings, and utility facilities. Mr. Griffin testified these topographic and man-made features in a significant number of situations will prohibit the location of a development well on a Rule 202(a) approved site. In other situations, the reasonable accommodation of surface values with drilling and development activities can best be accomplished by not drilling at a location which would otherwise be appropriate under Rule 202(a).

I find, location flexibility is needed so that wells may be drilled at a sufficient distance from environmentally sensitive areas. The Supervisor finds that allowing Antrim Shale gas well developers latitude in drilling location selection will serve to avoid surface waste. The Supervisor further finds that, for Antrim

Shale gas wells, imposing the rigid well spacing pattern required by Rule 202(a) is not necessary in order to avoid waste and protect correlative rights.

I find, slot or window spacing, whereby all Antrim Shale gas wells may be located anywhere on the drilling unit not less than 330 feet from a unit line, will allow the Antrim Shale gas developer sufficient flexibility to locate a well so as to avoid surface features incompatible with drilling and will allow the accommodation of other surface usages.

5. Mr. Griffin submitted into evidence four cross-sections of Antrim Shale well logs. Exhibit 5 illustrated 16 well logs along a North-South cross section from Otsego County to Hillsdale County. The other three log cross sections (Exhibits 4, 6 and 7) cross the lower peninsula from West to East. These logs consistently show the presence of the Antrim Shale Formation in the central and southern lower peninsula of Michigan. Exhibit 8, titled "Major Devonian Structural Features in the Michigan Basin," shows known fracture systems in the basin and shows the presence of the Antrim Shale in all counties except Monroe County. One theory is that the structural features caused the fractures which contribute to Antrim Shale productivity. I find, these exhibits illustrate that potentially productive Antrim Shale structure is present throughout all of the 42 counties subject to this proceeding.

6. The petition also requests the approval of alternate completion techniques for Antrim Shale gas wells. The Petitioner's witness testified the Antrim Shale Formation appears to be relatively flat throughout the 42 counties covered by this Petition. The Antrim Shale is tight, exhibiting low porosity and permeability. Achieving commercial levels of production appears to be dependent on encountering natural fracture zones or successfully fracturing the formation. He testified, if natural fracturing is absent or insufficiently developed, commercial production may require increased exposure of the formation to the well bore. Mr. Griffin testified alternate completion techniques are necessary to allow the operator to encounter as much of the productive or potentially productive portions of the Antrim Shale as possible. Petitioner requests approval of well completion techniques, other than a vertical hole, which will allow for a variety of completions in the Antrim Shale. First, a directionally drilled well may encounter a more productive area. A second completion technique is the lateral drain hole (LDH). A LDH will provide the opportunity to expose much more of the Antrim Shale to the well bore than either a vertical or directional well. Third, a potential technique is to drill one or more LDHs from a single vertical or directional well bore. The operator may elect to drill multiple

LDHs in one particular strata in the Antrim Shale, or LDHs variously located in one or more of the various strata making up the Antrim Shale. Mr. Griffin testified these techniques will prevent waste by making Antrim gas wells more productive and leaving less gas in the formation.

7. I find, the nature of the Antrim Shale and the productive characteristics of Antrim Shale gas wells is such that use of the alternate completion techniques proposed by Petitioner will not result in waste and will not interfere with the correlative rights of adjoining property owners.

8. The Supervisor of Wells finds that the completion techniques suggested by Petitioner are appropriate for the Antrim Shale. I find, all productive portions of vertical, directional, or LDH wells, and all portions of such wells which are open to the formation, should be located not less than 330 feet from a drilling unit boundary line to protect correlative rights.

#### CONCLUSIONS OF LAW

1. Act 61, as amended, provides in Section 6 that the Supervisor shall prevent waste and to that end is empowered to fix the spacing of wells. Act 61, as amended, provides in Section 13 that the Supervisor may provide for well locations in the approximate center of the drilling unit or at such other locations thereon as are necessary to conform to a uniform well spacing pattern as adopted after notice and hearing.

2. The Supervisor of Wells has jurisdiction over the subject matter and the persons interested therein. Due notice of the time, place, and purpose of the hearing was given as required by law, and all interested parties were afforded an opportunity to be heard.

3. A well spacing pattern which allows wells anywhere on the drilling unit not less than 330 feet from a drilling unit boundary satisfies the requirement for a well spacing pattern as contemplated by Section 13 of Act 61.

4. Rule 203 provides that a special spacing order may be entered for a specific geological formation to control the development of a gas field and the well spacing pattern may be other than that specified by Rule 201(a). 1979 AC, R 299.1203.

ADVISORY COMMITTEE RECOMMENDATION

The Oil and Gas Advisory Committee recommends approval of the requested location exceptions and the techniques for completing gas wells in the Antrim Shale Formation.

DETERMINATION AND ORDER

Based on the Findings of Fact and Conclusions of Law, it is the determination of the Supervisor of Wells that location exceptions and various completion techniques are necessary to prevent waste and assure the orderly development of the Antrim Shale Formation.

NOW, THEREFORE, IT IS ORDERED:

1. For purposes of this order the Antrim Shale Formation is defined to include those formations from the top of the "Upper Antrim," "Light Antrim," or the "Ellsworth Shale" down to the strata at the top of and immediately above the Traverse Group.

(2) An exception to the well location rules, Rules 201 and 202, is granted for the Antrim Shale Formation in the following counties in the lower peninsula of Michigan:

Allegan, Barry, Berrien, Branch, Calhoun, Cass, Clare, Clinton, Eaton, Genesee, Gladwin, Gratiot, Hillsdale, Huron, Ingham, Ionia, Isabella, Jackson, Kalamazoo, Kent, Lapeer, Lenawee, Livingston, Macomb, Mecosta, Midland, Montcalm, Muskegon, Newaygo, Oakland, Oceana, Osceola, Ottawa, Saginaw, Sanilac, St. Clair, St. Joseph, Shiawassee, Tuscola, Van Buren, Washtenaw, and Wayne.

(3) All wells completed in the Antrim Shale Formation may be completed by any technique listed in paragraph (4), following, provided that the producing portion of the well bore and that portion of the well bore exposed to the Antrim Shale Formation, or one or more lateral drain hole(s), is no closer than 330 feet from the boundary of a drilling unit.

(4) Appropriate techniques for completing wells in the Antrim Shale Formation for gas production are as follows:

- a. Drill and complete a standard vertical well.
- b. Drill and complete a well by conventional directional drilling.

c. Drill and complete one or more lateral drain holes within the productive interval in conjunction with a standard vertical well or a conventional directional well. The drilling of one or more lateral drain holes from a single vertical or directionally drilled well shall not require an additional drilling permit. However, a well bore survey shall be filed with the Geological Survey Division, identifying the course and end point of all lateral drain holes, within 30 days after completion of the survey.

5. Each vertical or directionally drilled well will require a separate drilling permit. However, any number of LDHs may be drilled from a single vertical or directional well without additional permits.

6. The location provisions and completion techniques approved in this Order are available for use by all developers.

7. This Order shall apply to gas producing wells only.

8. The Supervisor of Wells shall retain continuing jurisdiction in order that he may exercise administrative control consistent with his powers and duties as established by the applicable statutes of the State of Michigan.

Dated: April 10 , 1995

  
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SAMUEL L. ALGUIRE  
ACTING ASSISTANT SUPERVISOR OF WELLS