Yates Petroleum Corp.
Loveless LQ State No. 9
HORIZONTAL PROSPECT
Tomahawk San Andres
SECTION VIEW

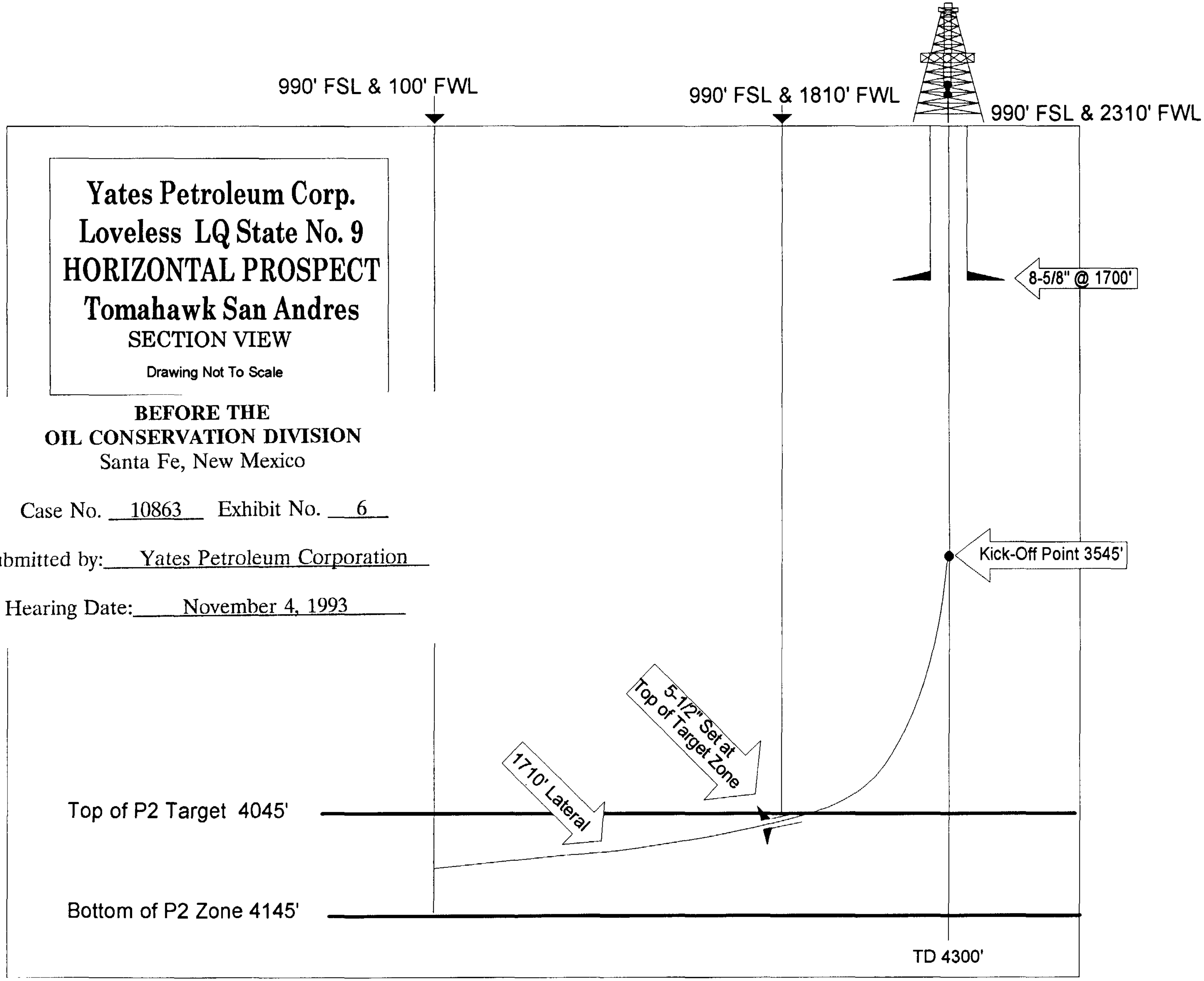
Drawing Not To Scale

BEFORE THE
OIL CONSERVATION DIVISION
Santa Fe, New Mexico

Case No. 10863 Exhibit No. 6

Submitted by: Yates Petroleum Corporation

Hearing Date: November 4, 1993



BEFORE THE
OIL CONSERVATION DIVISION
Santa Fe, New Mexico

Case No. 10863 Exhibit No. 7

Submitted by: Yates Petroleum Corporation

Hearing Date: November 4, 1993

Decline curve analysis predicts oil recovery from horizontal wells

Pralhad N. Mutalik, Sada D. Joshi *Joshi Technologies International Inc. Tulsa*

For the transient and post-transient decline periods of a horizontal well in a bounded reservoir, an analytical model has been developed that can forecast recoverable reserves. This decline curve method predicts future performance of both new and existing horizontal wells.

The model can also be used to develop horizontal well type curves.

Concepts

Two key issues in determining horizontal well performance and ultimate recovered reserves are well length and spacing. These issues are especially important in reservoirs where pressure decreases with time.

In a vertical well, the well bore contacts only the reservoir height. But depending on the length drilled, horizontal wells can have much greater exposure to the reservoir.

Over an equal time interval, a long horizontal well can drain a significantly larger reservoir volume than a vertical well. But closely spaced horizontal wells may interfere with each other very rapidly, resulting in lower ultimate reserves per well. Thus, optimizing well length and well spacing is important.

One method for optimizing these factors is by developing the expected production rate-vs.-time performance or production decline curves.

After a well starts production, time is needed for the flow rate to stabilize. The production before the rate stabilizes is known as "transient" or "flush" production.

Depending upon the reservoir properties, the transient period may last from a few days to several months. In low permeability reservoirs, the transient time may last for years.

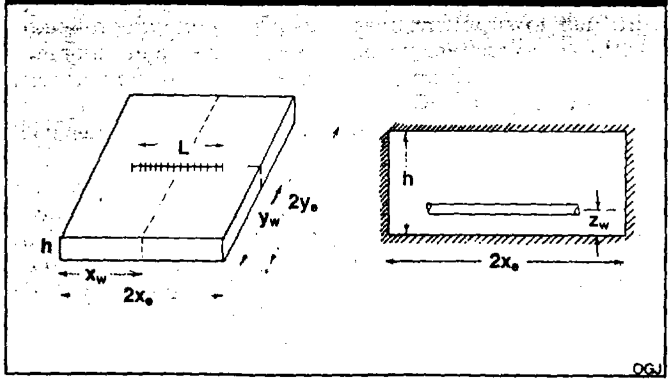
Conventional analytical methods calculate horizontal well productivities primarily for stabilized flow.[1] Steady-state equations are for reservoirs with good pressure support in which pressure remains essentially constant. Pseudosteady-state equations are for reservoirs where pressure decreases with time.

In general, the stabilized productivity calculations based on either steady state or pseudosteady-state methods give lower production rates than observed in the transient flow period.

In low-permeability reservoirs, especially with large well spacing, the transient period may last 1 year or more. Because wells may payout during the transient period alone, investment decisions based on steady-state calculations without considering transient production may miss an opportunity. Therefore, forecasting transient well performance is very important for low-permeability reservoirs.

Fig. 1

HORIZONTAL WELL IN A BOUNDED RESERVOIR



Production forecasts

The transient-flow solution is expressed in terms of dimensionless quantities. Dimensionless numbers are easy to apply and provide simple, general equations

Some useful definitions

Constant pressure and constant rate solutions

For mathematical treatment, two modes of transient production are usually considered:

1. Constant flowing well bore pressure
2. Constant production rate

A constant flowing well bore pressure is assumed only for mathematical simplicity. In reality, flowing wellhead pressure is maintained constant and is typical of low productivity wells producing against the constant pressure of a separator. The constant wellhead pressure implies a decline in production rate.

On the other hand, constant rate production implies that flowing bottom hole and wellhead pressures are declining with time. This is typical of fields where the production level is limited by one of the following factors:

- Limited surface handling and processing facilities
- Sales and delivery contracts with fixed delivery levels
- Production at critical rates, due to gas/water coning problems
- Production allowables and regulatory constraints.

Transient and pseudosteady-state flow

When a well is first put on production, the pressure transient travels away from the well towards the well drainage boundaries. Once the pressure transient has reached all the drainage boundaries, then the average reservoir pressure starts dropping with time. This flow period before the well sees the drainage boundaries is known as the transient state.

Depletion state is the post-transient flow period and is also known as the pseudosteady state flow period.

Time to reach pseudosteady state

The time to reach pseudosteady state is defined as the time required for the pressure transient to reach all the drainage boundaries.

Transient calculations

The constant rate solution for a horizontal well in a closed rectangle has been presented by many researchers.[3-6]

Equation 5 in the equation box defines the dimensionless pressure for a horizontal well in a closed bounded reservoir at any instant. This equation describes the pressure distribution in the reservoir and is made up of three summation terms for each of the x, y, and z directions, respectively.

In this equation, the dimensionless parameters, x_{eD} and y_{eD}, define the dimensions of the drainage area with respect to the horizontal well length, L. The location of the horizontal well in the drainage area is defined by the dimensionless variables, x_{wD}, y_{wD}, and z_{wD}.

Equation 5 represents the constant rate solution for a horizontal well producing at a prescribed flow rate in a closed (no-flow boundaries) rectangular reservoir. Given this constant rate solution, p_{wDL}, for a horizontal well, the dimensionless rate response, q_D, was developed by using Duhamel's principle.

In real time form, this calculation would involve recursive integration procedures. Hence, the Laplace space equivalent was used to derive the dimensionless rate, q_D, as:

$$\overline{q_D} = 1/s^2\overline{p_{wDL}}$$

The term s denotes the Laplace variable and the overline denotes the Laplace space solution. The $\overline{p_{wDL}}$ represents the Laplace space solution for a horizontal well produced at a constant rate.

The above equation is the well known superposition result of van Everdingen and Hurst.[11]

This equation tells us that given the Laplace space solution (i.e., $\overline{p_{wDL}}$), one can easily develop the dimensionless rate solution for the constant-pressure production problem. The real-time solution for the dimensionless rate, q_D, was derived by numerically inverting this solution using Stehfest's algorithm. The constant-rate solution, described by Equation 5 in the equation box, was used to derive the Laplace solution, $\overline{p_{wDL}}$.

Nomenclature

A =	Well drainage area, acres
B =	Oil formation factor, res bbl/st-tk bbl
b =	Decline exponent, dimensionless (Exponential decline b = 0, hyperbolic decline 0<b<1, and harmonic decline b = 1)
c_t =	Total compressibility, psi^{-1}
D_i =	Decline coefficient, $days^{-1}$
h =	Reservoir height, ft
k =	Permeability, md
k_v =	Vertical permeability, md
k_h =	Horizontal permeability, md
k_x =	Permeability parallel to well bore, md
k_y =	Permeability perpendicular to well bore, md
L =	Horizontal well length, ft
L_D =	Dimensionless well length
p_D =	Dimensionless pressure
p_i =	Initial reservoir pressure, psi
p_{wf} =	Well flowing pressure, psi
q =	Oil production rate, st-tk b/d
q_D =	Dimensionless oil production rate
q_i =	Flow rate at the beginning of the depletion state, st-tk bbl
r_e =	Well drainage radius, ft
r_w =	Well bore radius, ft
r_{wD} =	Dimensionless well bore radius
t =	Time, hr
t_D =	Dimensionless time
t_{DA} =	Dimensionless time based on drainage area
x_e, y_e =	Half the drainage area dimensions in x and y direction, ft
x_w, y_w, z_w =	Distance of horizontal well center from drainage area boundaries, ft
ϕ =	Reservoir porosity, fraction
μ =	Oil viscosity, cp

Table 1

Naturally fractured reservoir

Horizontal well length = 1,500 ft
Pay zone thickness = 35 ft
Porosity = 2.8%
Horizontal permeability = 0.7 md
Vertical permeability = 0.35 md
Initial reservoir pressure = 4,400 psia
Bottom hole pressure = 2,300 psia
Oil viscosity = 0.3 cp
Formation volume factor = 1.2 res bbl/st-tk bbl
Total compressibility = 1.2×10^{-5} psi^{-1}
Initial water saturation = 0.3 fraction
Annual percent decline = 20%

Days	Production, st-tk bbl	Cumulative oil, st-tk bbl
10	4,848	4,848
41	12,654	17,502
72	8,191	25,693
102	10,559	36,252
133	9,953	46,205
163	8,841	55,046
194	8,383	63,249
225	7,744	71,173
253	6,639	77,810
284	6,386	84,200
314	6,061	90,260
345	4,921	95,180
375	3,296	98,480
406	9,586	108,062
437	7,361	115,423
467	6,130	121,553
498	6,580	128,133
528	5,445	133,578
559	4,054	137,632

two important decline parameters are b and D_i. The decline exponent b is determined by the reservoir producing mechanism. Typically, b is 0.3 for solution-gas-drive reservoirs and 0.5 for reservoirs producing by water drive or gravity-drainage.[7,8] The exponential decline solution, b = 0, provides the most conservative forecast.

The decline coefficient, D_i, represents the initial decline rate at the beginning of the depletion state. As the area drained by a well increases, r_e/r_w becomes larger and the D_i is reduced (Equation 7).

This indicates that, for a given economic cutoff rate, the well having greater spacing will show a slower decline rate, and hence higher cumulative oil recovery.

Type curves

Type curves have been used to estimate reservoir parameters such as permeability, drainage area, etc. A number of type curves are available for vertical wells.

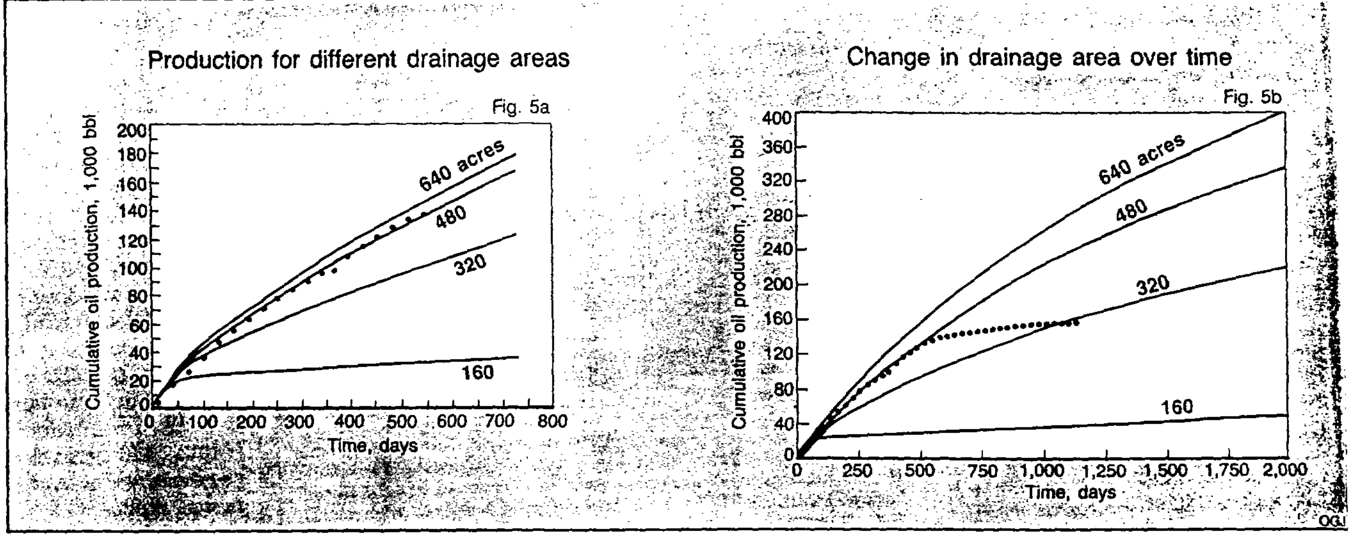
For a constant flowing bottom hole pressure, type curves are essentially plots of dimensionless rate, q_D, vs. dimensionless time, t_D. The analytical model previously described has been used to develop new type curves for a horizontal well located in a closed drainage area.

In the case of horizontal wells, for a given value of r_{wD} and $L/2x_e$, different type curves have to be generated for each value of L_D. Fig. 2a shows a typical horizontal well type curve for L_D=3.

If L_D is large, i.e., for very long wells or for very thin zones, the effect of reservoir height on dimensionless curve declines. Thus, for very large L_D such as L_D>20,

Fig. 5

Analysis of naturally fractured horizontal well



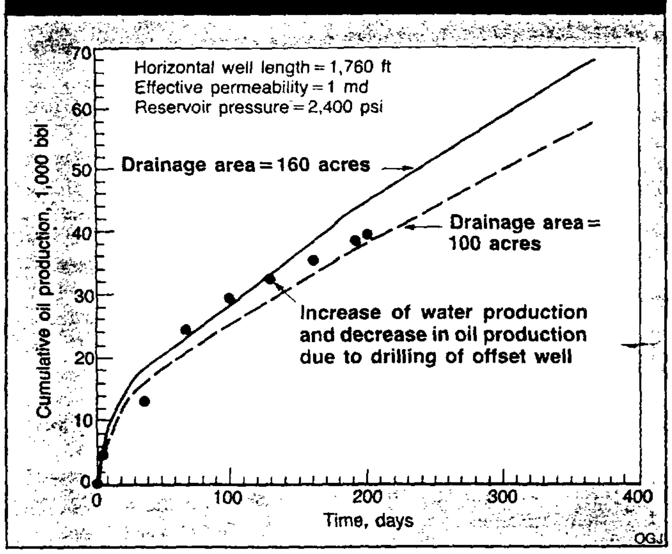
The analytical solution in the depletion period represents an exponential decline (b=0) of well flow rates. This is simply because the analytical solution in a closely bounded drainage volume assumes that the total compressibility of the rock and fluids is the only mechanism that provides pressure support to the reservoir.

In practice, during the decline phase, in addition to pressure support from total compressibility of the system, the reservoir may get additional pressure support that depends upon the reservoir mechanism. For example, in a solution-gas-drive reservoir, the gas released from the oil could provide extra pressure support. Similarly, a large gas cap or aquifer can also provide pressure support.

Thus, during the depletion phase, this extra pressure support will slow a well's production rate decline over time more than the decline shown in Fig. 2b. These factors can be accounted for by using Arps and Fetkovich decline curves[7,8] for the depletion-phase calculations.

Fig. 6

History before and after drilling offset well



Forecasts

Similar to vertical wells, type curves developed for horizontal wells can estimate reservoir parameters by overlaying, on the type curve, log-log plots of the horizontal well's historical production.

Estimated values include reservoir permeability, drainage area, and a back calculation of an effective horizontal well length. From this effective length, a producing well length can be calculated.

The producing length can be different than the drilled length. This difference could be due to either geological or mechanical factors.

Well rate can also be estimated from type curves by using the reservoir and well parameters, and q_D and t_D. The example box shows the details for estimating the performance from a 2,400-ft long horizontal well in a 130-ft thick reservoir. The example provides a 10-year forecast obtained from the type curve for $L_D=3$ (Fig. 2a). A horizontal well's rate-vs.-time forecast is plotted in Fig. 3.

Areal anisotropy

The previous example assumes uniform areal permeability, i.e. $k_x=k_y$. This may not be true in naturally fractured reservoirs, where the permeability along the fracture trend is larger than the direction perpendicular to the fractures. In such cases, the effective horizontal permeability, k_h, is calculated as:

$$k_h = \sqrt{k_x\ k_y}$$

In areally anisotropic reservoirs, the horizontal well should be drilled perpendicular to the high-permeability direction, i.e., parallel to the low-permeability direction. Assuming the expected drainage along the x direction is $2x_e$ (Fig. 2a) and the well is drilled along the low-permeability x direction, the expected drainage along the y direction, $2y_e$, will be:

$$2y_e = \sqrt{(k_y/k_x)} \times 2x_e$$

In general, k_x is very difficult to estimate. One possible method to obtain k_y/k_x is from interference tests on the wells. Typically, only average values of k_y/k_x for a given portion of the field can be estimated.

Areally, the estimated k_y/k_x could range from 1 for a uniform homogeneous reservoir to close to 80 to 100 in some naturally fractured reservoirs. However, in places along the horizontal well length, the value of k_y/k_x could be several hundred and can be difficult to estimate.

At least from the production and economic point of view, the concept of effective horizontal permeability, drilling appears to play a dominant role in the reduction of well drainage area, thereby reducing the ultimate recovered reserves per well.

History match

A field history match and forecast were made for a horizontal well drilled in the Austin Chalk formation in Texas. To model this dual porosity system, the concept of effective permeability was used to develop the well production forecasts.

For horizontal Well X, history matching the early time production performace estimated an effective permeability of about 1 md. The match was based on 160 acre spacing,

However, after about 10 months of production, an offset operator drilled Well Y increasing the water cut and decreasing oil production from Well X. This resulted in a reduction in the drainage area of the well.

Fig. 6 shows the history match before and after the offset well. The offset well decreased the drainage area of Well X to 100 acres from 160 acres, and therefore decreased the well's recoverable oil reserves.

Thus the model provides a good starting point to evaluate horizontal well potential in naturally fractured formations. The use of effective permeability for developing the forecasts provides reasonable answers.

Acknowledgments

We would like to thank our colleagues Wenzhong Ding, Kevin Hall, W.B. Lumpkin and Susan Lacy and Mustafa Onur, assistant professor, Istanbul Technical University for their assistance in developing and testing the model.

References

1. Joshi, S.D., Horizontal Well Technology, PennWell Publishing Co., Tulsa, 1991.
2. Ozkan, E., Raghavan, R., and Joshi, S.D., "Horizontal-Well Pressure Analysis," SPE Formation Evaluation, December 1989, pp. 567-75.
3. Mutalik, P.N., Godbole, S.P., and Joshi, S.D., "Effect of Drainage Area Shapes on the Productivity of Horizontal Wells," Paper No. SPE 18301, SPE 63rd Annual Technical Conference, Houston, Oct. 2-5, 1988.
4. Babu, D.K. and Odeh, A.S., "Productivity of a Horizontal Well," SPE Reservoir Engineering, November 1989, pp. 417-21.
5. Kuchuk, F.J., Goode, P.A., Brice, B.W., Sherrard, D.W. and Thambynayagam, R.K.M., "Pressure Transient Analysis and Inflow Performance for Horizontal Wells," Paper No. SPE 18300, SPE 63rd Annual Technical Conference and Exhibition, Houston, Oct. 2-5, 1988.
6. Thompson, L.G., Manrique, J.L., and Jelmert, T.A., "Efficient Algorithms for Computing the Bounded Reservoir Horizontal Well Pressure Response," Paper No. SPE 21827, Rocky Mountain Regional Meeting and Low Permeability Reservoir Symposium, Denver, Apr. 15-17, 1991.
7. Arps, J.J., "Analysis of Decline Curves," Petroleum Transactions, AIME, Vol. 160, 1945, pp. 228-47.
8. Fetkovich, M.J., "Decline Curve Analysis Using Type Curves," Journal of Petroleum Technology, June 1980, pp. 1065-77.
9. Locke, C.D. and Sawyer, W.K., "Constant Pressure Injection Test in a Fractured Reservoir History Match Using Numeric Simulation and Type Curv Analysis," Paper No. SPE 559 SPE Annual Meeting, Dalla Sept. 28-Oct. 1, 1975.
10. Earlougher, R.C., Advances Well Test Analysis, SPE Mon graph No. 5, 1977, pp. 1065-77
11. Van Everdingen, A.F., an Hurst, W., "The Application the Laplace Transformation Flow Problems in Reservoirs Transactions, AIME, Vol. 18 1949, pp. 305-324.
12. Joshi, S.D., "A Review of Hor zontal Well and Drainhole Tec nology," Paper No. SPE 1686 SPE Annual Technical Confe ence, Dallas, 1987, and revise version SPE Rocky Mountain R gional Meeting, Casper, Wyo May 1988.

Nelson-Farrar Cost Indexes

Refinery construction (1946 Basis)

(Explained on p. 145 of the Issue of Dec. 30, 1985)

	1962	1976	1989	1990	1991	Apr. 1991	Mar. 1992	Apr. 1992
Pumps, compressors, etc.	222.5	538.6	1086.3	1125.6	1177.8	1175.6	1210.5	1213.4
Electrical machinery	189.5	287.2	533.1	541.0	548.1	548.2	551.3	550.4
Internal-comb. engines	183.4	348.3	721.8	753.8	794.4	791.1	806.2	801.8
Instruments	214.8	466.4	770.3	811.4	844.7	843.5	854.6	861.1
Heat exchangers	183.6	478.5	737.8	755.7	772.6	771.6	771.1	763.3
Misc. equip. average	198.8	423.8	769.9	797.5	827.5	826.0	838.8	838.0
Materials component	205.9	445.2	829.2	832.8	832.3	837.0	829.7	828.5
Labor component	258.8	729.4	1440.4	1487.7	1533.3	1513.3	1561.2	1564.3
Refinery (Inflation) Index	237.6	615.7	1195.9	1225.7	1252.9	1242.8	1268.6	1270.0

Refinery operating (1956 Basis)

(Explained on p. 145 of the Issue of Dec. 30, 1985)

	1962	1976	1989	1990	1991	Apr. 1991	Mar. 1992	Apr. 1992
Fuel cost	100.9	384.5	503.0	558.1	443.8	438.2	366.4	382.3
Labor cost	93.9	145.5	257.4	270.5	280.8	286.8	296.3	285.0
Wages	123.9	314.3	709.3	753.7	787.4	799.0	831.7	821.5
Productivity	131.8	216.1	275.9	279.2	280.6	278.5	280.7	288.3
Invest., maint., etc.	121.7	252.6	502.5	512.9	511.4	507.2	515.7	516.3
Chemical costs	96.7	195.2	230.4	233.6	228.5	230.9	216.3	217.1
Operating indexes Refinery	103.7	209.3	384.9	399.7	392.2	392.4	391.9	389.4
Process units*	103.6	267.1	429.1	456.0	418.6	416.9	397.6	400.0

*Add separate index(es) for chemicals, if any are used. See current Quarterly Costimating, first issue, months of January, April, July, and October.

These indexes are published in the first issue of each month. They are compiled by Gerald L. Farrar, Journal Contributing Editor.

Indexes of selected individual items of equipment and materials are also published on the Costimating page in the first issue of the months of January, April, July, and October.

BEFORE THE

OIL CONSERVATION DIVISION

NEW MEXICO DEPARTMENT OF ENERGY, MINERALS AND NATURAL RESOURCES

IN THE MATTER OF THE APPLICATION
OF YATES PETROLEUM CORPORATION
FOR A HORIZONTAL DIRECTIONAL
DRILLING PILOT PROJECT AND
SPECIAL OPERATING RULES THEREFOR,
CHAVES COUNTY, NEW MEXICO. CASE NO. 10863

AFFIDAVIT

STATE OF NEW MEXICO)
) ss.
COUNTY OF SANTA FE)

William F. Carr, attorney in fact and authorized representative of Yates Petroleum Corporation, the Applicant herein, being first duly sworn, upon oath, states that in accordance with the notice provisions of Rule 1207 of the New Mexico Oil Conservation Division the Applicant has attempted to find the correct addresses of all interested persons entitled to receive notice of this application and that notice has been given at the addresses shown on Exhibit "A" attached hereto as provided in Rule 1207.

William F. Carr

SUBSCRIBED AND SWORN to before me this 3rd day of November, 1993.

Notary Public

My Commission Expires:
August 19, 1995

EXHIBIT A

Strata Production Company
648 Petroleum Building
Roswell, NM 88201

Murphy Operating Corporation
Box 2648
Roswell, NM 88202-2648

Yates Energy
105 South Fourth Street
Artesia, NM 88210

Kerr-McGee Corporation
Post Office Box 11050
Midland, TX 79702

PEDCO
(Petroleum Development Corporation)
9720 B Candelaria, NE
Albuquerque, New Mexico 87112

BEFORE THE
OIL CONSERVATION DIVISION
Santa Fe, New Mexico

Case No. 10863 Exhibit No. 8

Submitted by: Yates Petroleum Corporation

Hearing Date: November 4, 1993

CAMPBELL, CARR, BERGE
& SHERIDAN, P.A.
LAWYERS

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WILLIAM F. CARR
BRADFORD C. BERGE
MARK F. SHERIDAN
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TELEPHONE: (505) 988-4421
TELECOPIER: (505) 983-6043

October 13, 1993

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Strata Production Company
648 Petroleum Building
Roswell, NM 88201

Re: Application of Yates Petroleum Corporation for a Horizontal Directional Drilling Pilot Project and Special Operating Rules, Chaves County, New Mexico

Gentlemen:

This letter is to advise you that Yates Petroleum Corporation has filed the enclosed application with the New Mexico Oil Conservation Division seeking approval to horizontally drill a well in Section 36, Township 7 South, Range 31 East, N.M.P.M., in the Tomahawk-San Andres Pool.

This application has been set for hearing before an Examiner of the Oil Conservation Division on November 4, 1993. You are not required to attend this hearing, but as an owner of an interest that may be affected by this application, you may appear at the hearing and present testimony. Failure to appear at that time and become a party of record will preclude you from challenging the matter at a later date.

Parties appearing in cases have been requested by the Division (Memorandum 2-90) to file a Prehearing Statement substantially in the form prescribed by the Division. Prehearing statements should be filed by 4:00 o'clock p.m. on the Friday before a scheduled hearing.

Very truly yours,

WILLIAM F. CARR
ATTORNEY FOR YATES PETROLEUM CORPORATION
WFC:mlh
Enc.

P 176 017 083

Receipt for Certified Mail

No Insurance Coverage Provided

Strata Production Company
648 Petroleum Building
Roswell, NM 88201

Postage	$
Certified Fee	
Special Delivery Fee	
Restricted Delivery Fee	
Return Receipt Showing to Whom & Date Delivered	
Return Receipt Showing to Whom, Date, and Addressee's Address	
TOTAL Postage & Fees	$
Postmark or Date	October 13, 1993

PS Form 3800, June 1991

SENDER: Complete items 1 and 2 when additional services are desired, and complete items 3 and 4.
Put your address in the "RETURN TO" Space on the reverse side. Failure to do this will prevent this card from being returned to you. The return receipt fee will provide you the name of the person delivered to and the date of delivery. For additional fees the following services are available. Consult postmaster for fees and check box(es) for additional service(s) requested.

1. ☐ Show to whom delivered, date, and addressee's address. *(Extra charge)*
2. ☐ Restricted Delivery *(Extra charge)*

3. Article Addressed to:

Strata Production Company
648 Petroleum Building
Roswell, NM 88201

4. Article Number
P 176 017 083

Type of Service:
☐ Registered ☐ Insured
☒ Certified ☐ COD
☐ Express Mail ☒ Return Receipt for Merchandise

Always obtain signature of addressee or agent and DATE DELIVERED.

5. Signature – Address
X

6. Signature – Agent
X Gari J. Anderson

7. Date of Delivery
10-15-93

8. Addressee's Address *(ONLY if requested and fee paid)*

PS Form 3811, Mar. 1988 ★ U.S.G.P.O. 1988-212-865 DOMESTIC RETURN RECEIPT

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& SHERIDAN, P.A.
LAWYERS

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POST OFFICE BOX 2208
SANTA FE, NEW MEXICO 87504-2208
TELEPHONE: (505) 988-4421
TELECOPIER: (505) 983-6043

October 13, 1993

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Murphy Operating Corporation
Box 2648
Roswell, NM 88202-2648

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Very truly yours,

WILLIAM F. CARR
ATTORNEY FOR YATES PETROLEUM CORPORATION
WFC:mlh
Enc.

● **SENDER:** Complete items 1 and 2 when additional services are desired, and complete items 3 and 4.
Put your address in the "RETURN TO" Space on the reverse side. Failure to do this will prevent this card from being returned to you. The return receipt fee will provide you the name of the person delivered to and the date of delivery. For additional fees the following services are available. Consult postmaster for fees and check box(es) for additional service(s) requested.
1. ☐ Show to whom delivered, date, and addressee's address. *(Extra charge)*
2. ☐ Restricted Delivery *(Extra charge)*

3. Article Addressed to: Murphy Operating Corporation Box 2648 Roswell, NM 88202-2648	**4. Article Number** P 176 017 084 **Type of Service:** ☐ Registered ☐ Insured ☒ Certified ☐ COD ☐ Express Mail ☒ Return Receipt for Merchandise Always obtain signature of addressee or agent and DATE DELIVERED.
5. Signature — Address X	**8. Addressee's Address** *(ONLY if requested and fee paid)*
6. Signature — Agent X Alisha Hudgins	
7. Date of Delivery	

PS Form **3811**, Mar. 1988 ★ U.S.G.P.O. 1988-212-865 **DOMESTIC RETURN RECEIPT**

P 176 017 084

Receipt for Certified Mail
No Insurance Coverage Provided

Murphy Operating Corporation
Box 2648
Roswell, NM 88202-2648

Postage	$
Certified Fee	
Special Delivery Fee	
Restricted Delivery Fee	
Return Receipt Showing to Whom & Date Delivered	
Return Receipt Showing to Whom, Date, and Addressee's Address	
TOTAL Postage & Fees	$
Postmark or Date October 13, 1993	

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CAMPBELL, CARR, BERGE
& SHERIDAN, P.A.
LAWYERS

MICHAEL B. CAMPBELL
WILLIAM F. CARR
BRADFORD C. BERGE
MARK F. SHERIDAN
WILLIAM P. SLATTERY

PATRICIA A. MATTHEWS
MICHAEL H. FELDEWERT
DAVID B. LAWRENZ
TANYA M. TRUJILLO

JACK M. CAMPBELL
OF COUNSEL

JEFFERSON PLACE
SUITE 1 - 110 NORTH GUADALUPE
POST OFFICE BOX 2208
SANTA FE, NEW MEXICO 87504-2208
TELEPHONE: (505) 988-4421
TELECOPIER: (505) 983-6043

October 13, 1993

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Yates Energy
105 South Fourth Street
Artesia, NM 88210

Re: Application of Yates Petroleum Corporation for a Horizontal Directional Drilling Pilot Project and Special Operating Rules, Chaves County, New Mexico

Gentlemen:

This letter is to advise you that Yates Petroleum Corporation has filed the enclosed application with the New Mexico Oil Conservation Division seeking approval to horizontally drill a well in Section 36, Township 7 South, Range 31 East, N.M.P.M., in the Tomahawk-San Andres Pool.

This application has been set for hearing before an Examiner of the Oil Conservation Division on November 4, 1993. You are not required to attend this hearing, but as an owner of an interest that may be affected by this application, you may appear at the hearing and present testimony. Failure to appear at that time and become a party of record will preclude you from challenging the matter at a later date.

Parties appearing in cases have been requested by the Division (Memorandum 2-90) to file a Prehearing Statement substantially in the form prescribed by the Division. Prehearing statements should be filed by 4:00 o'clock p.m. on the Friday before a scheduled hearing.

Very truly yours,

WILLIAM F. CARR
ATTORNEY FOR YATES PETROLEUM CORPORATION
WFC:mlh
Enc.

SENDER: Complete items 1 and 2 when additional services are desired, and complete items 3 and 4.
Put your address in the "RETURN TO" Space on the reverse side. Failure to do this will prevent this card from being returned to you. The return receipt fee will provide you the name of the person delivered to and the date of delivery. For additional fees the following services are available. Consult postmaster for fees and check box(es) for additional service(s) requested.
1. ☐ Show to whom delivered, date, and addressee's address. *(Extra charge)*
2. ☐ Restricted Delivery *(Extra charge)*

3. Article Addressed to: Yates Energy 105 South Fourth Street Artesia, NM 88210	4. Article Number P 176 017 085 Type of Service: ☐ Registered ☐ Insured ☒ Certified ☐ COD ☐ Express Mail ☒ Return Receipt for Merchandise Always obtain signature of addressee or agent and DATE DELIVERED.
5. Signature – Address X Cykeitha Boyse 6. Signature – Agent X 7. Date of Delivery 10-15-93	8. Addressee's Address *(ONLY if requested and fee paid)*

PS Form **3811**, Mar. 1988 ★ U.S.G.P.O. 1988-212-865 **DOMESTIC RETURN RECEIPT**

P 176 017 085

Receipt for Certified Mail

No Insurance Coverage Provided

Yates Energy
105 South Fourth Street
Artesia, NM 88210

Postage	$
Certified Fee	
Special Delivery Fee	
Restricted Delivery Fee	
Return Receipt showing to Whom & Date Delivered	
Return Receipt showing to Whom, Date, and Addressee's Address	
TOTAL Postage & Fees	$
Postmark or Date October 13, 1993	

PS Form 3800, June 1991

CAMPBELL, CARR, BERGE
& SHERIDAN, P.A.
LAWYERS

MICHAEL B. CAMPBELL
WILLIAM F. CARR
BRADFORD C. BERGE
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POST OFFICE BOX 2208
SANTA FE, NEW MEXICO 87504-2208
TELEPHONE (505) 988-4421
TELECOPIER (505) 983-6043

October 13, 1993

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Kerr-McGee Corporation
Post Office Box 11050
Midland, TX 79702

Re: Application of Yates Petroleum Corporation for a Horizontal Directional Drilling Pilot Project and Special Operating Rules, Chaves County, New Mexico

Gentlemen:

This letter is to advise you that Yates Petroleum Corporation has filed the enclosed application with the New Mexico Oil Conservation Division seeking approval to horizontally drill a well in Section 36, Township 7 South, Range 31 East, N.M.P.M., in the Tomahawk-San Andres Pool.

This application has been set for hearing before an Examiner of the Oil Conservation Division on November 4, 1993. You are not required to attend this hearing, but as an owner of an interest that may be affected by this application, you may appear at the hearing and present testimony. Failure to appear at that time and become a party of record will preclude you from challenging the matter at a later date.

Parties appearing in cases have been requested by the Division (Memorandum 2-90) to file a Prehearing Statement substantially in the form prescribed by the Division. Prehearing statements should be filed by 4:00 o'clock p.m. on the Friday before a scheduled hearing.

Very truly yours,

WILLIAM F. CARR
ATTORNEY FOR YATES PETROLEUM CORPORATION
WFC:mlh
Enc.

P 176 017 086

Receipt for Certified Mail

No Insurance Coverage Provided

Kerr-McGee Corporation
Post Office Box 11050
Midland, TX 79702

Postage	$
Certified Fee	
Special Delivery Fee	
Restricted Delivery Fee	
Return Receipt Showing to Whom & Date Delivered	
Return Receipt Showing to Whom, Date, and Addressee's Address	
TOTAL Postage & Fees	$
Postmark or Date	

October 13, 1993

PS Form 3800, June 1991

● **SENDER:** Complete items 1 and 2 when additional services are desired, and complete items 3 and 4.
Put your address in the "RETURN TO" Space on the reverse side. Failure to do this will prevent this card from being returned to you. The return receipt fee will provide you the name of the person delivered to and the date of delivery. For additional fees the following services are available. Consult postmaster for fees and check box(es) for additional service(s) requested.
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2. ☐ Restricted Delivery *(Extra charge)*

3. Article Addressed to:

Kerr-McGee Corporation
Post Office Box 11050
Midland, TX 79702

4. Article Number
P 176 017 086

Type of Service:
☐ Registered ☐ Insured
☒ Certified ☐ COD
☐ Express Mail ☒ Return Receipt for Merchandise

Always obtain signature of addressee or agent and DATE DELIVERED.

5. Signature — Address
X

6. Signature — Agent
X [signature]

7. Date of Delivery

8. Addressee's Address *(ONLY if requested and fee paid)*

OCT 21 AM 1993

PS Form 3811, Mar. 1988 ★ U.S.G.P.O. 1988-212-865 — DOMESTIC RETURN RECEIPT

CAMPBELL, CARR, BERGE
& SHERIDAN, P.A.
LAWYERS

MICHAEL B. CAMPBELL
WILLIAM F. CARR
BRADFORD C. BERGE
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POST OFFICE BOX 2208
SANTA FE, NEW MEXICO 87504-2208
TELEPHONE: (505) 988-4421
TELECOPIER: (505) 983-6043

October 13, 1993

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

PEDCO
(Petroleum Development Corporation)
9720 B Candelaria, NE
Albuquerque, New Mexico 87112

Re: Application of Yates Petroleum Corporation for a Horizontal Directional Drilling Pilot Project and Special Operating Rules, Chaves County, New Mexico

Gentlemen:

This letter is to advise you that Yates Petroleum Corporation has filed the enclosed application with the New Mexico Oil Conservation Division seeking approval to horizontally drill a well in Section 36, Township 7 South, Range 31 East, N.M.P.M., in the Tomahawk-San Andres Pool.

This application has been set for hearing before an Examiner of the Oil Conservation Division on November 4, 1993. You are not required to attend this hearing, but as an owner of an interest that may be affected by this application, you may appear at the hearing and present testimony. Failure to appear at that time and become a party of record will preclude you from challenging the matter at a later date.

Parties appearing in cases have been requested by the Division (Memorandum 2-90) to file a Prehearing Statement substantially in the form prescribed by the Division. Prehearing statements should be filed by 4:00 o'clock p.m. on the Friday before a scheduled hearing.

Very truly yours,

WILLIAM F. CARR
ATTORNEY FOR YATES PETROLEUM CORPORATION
WFC:mlh
Enc.

P 176 017 087

Receipt for Certified Mail

No Insurance Coverage Provided

PEDCO
(Petroleum Development Corporation)
9720 B Candelaria, NE
Albuquerque, New Mexico 87112

Postage	$
Certified Fee	
Special Delivery Fee	
Restricted Delivery Fee	
Return Receipt Showing to Whom & Date Delivered	
Return Receipt Showing to Whom, Date, and Addressee's Address	
TOTAL Postage & Fees	$

Postmark or Date

October 15, 1993

PS Form 3800, June 1991

SENDER: Complete items 1 and 2 when additional services are desired, and complete items 3 and 4.
Put your address in the "RETURN TO" Space on the reverse side. Failure to do this will prevent this card from being returned to you. The return receipt fee will provide you the name of the person delivered to and the date of delivery. For additional fees the following services are available. Consult postmaster for fees and check box(es) for additional service(s) requested.

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2. ☐ Restricted Delivery *(Extra charge)*

3. Article Addressed to:

PEDCO
(Petroleum Development Corporation)
9720 B Candelaria, NE
Albuquerque, New Mexico 87112

4. Article Number
P 176 017 087

Type of Service:
☐ Registered ☐ Insured
☒ Certified ☐ COD
☐ Express Mail ☒ Return Receipt for Merchandise

Always obtain signature of addressee or agent and DATE DELIVERED.

5. Signature — Address
X

6. Signature — Agent
X [signature]

7. Date of Delivery
10-14-93

8. Addressee's Address *(ONLY if requested and fee paid)*

PS Form 3811, Mar. 1988 ★ U.S.G.P.O. 1988-212-865 DOMESTIC RETURN RECEIPT

PETROLEUM DEVELOPMENT CORPORATION

9720-B CANDELARIA, NE
ALBUQUERQUE, NEW MEXICO 87112
TELEPHONE (505) 293-4044

October 26, 1993

Yates Petroleum Corporation
105 South 4th
Artesia, NM 88210

Gentlemen:

In reference to Yates Petroleum Corporation's application before the Oil Conservation Division, New Mexico Department of Energy, for a horizontal directional drilling pilot project area, Case No. 10863, SW/4 of Section 36, T7S, R31E, Chaves County, New Mexico, Petroleum Development Corporation (Pedco) fully supports this application.

Pedco is the operator of the offset leases to the East, Northeast, West and Northwest to this 160 acre project area.

Pedco will also support a 4x80 barrel per day allowable for the 160 acre project area, which may be produced from any or all of the four existing wells and the Loveless LQ State No. 9.

Sincerely,

J.C. Johnson
President

JCJ:kc

BEFORE EXAMINER CATANACH
OIL CONSERVATION DIVISION
YATES EXHIBIT NO. 9
CASE NO. 10863