



Energy and Mines

Petroleum and Energy Branch

1395 Ellice Avenue Suite 360  
Winnipeg MB R3G 3P2  
CANADA

PH: (204) 945-6577  
PH: (204) 945-3760  
FAX: (204) 945-0586

FAXED

December 10, 1997

Anderson Exploration Ltd.  
1600-324 8th Avenue S.W.  
Calgary, Alberta  
T2P 2Z5

Attention: Brent Arnell

Dear Mr. Arnell:

**RE: Anderson Pierson 5-30-2-29 (WPM)  
Approval of Off-Target Penalty Waiver  
and Modification Board Order No. SU 9**

The Branch has approved Anderson's application for waiver of the off-target penalty for the subject well.

The Branch has also modified Board Order No. SU 9 reducing the 32 ha spacing area in the Pierson Field. A copy of the revised 32 ha spacing area is attached.

If you have any questions please contact the undersigned at (204) 945-6574.

Yours truly,



John N. Fox, P.Eng.  
Chief Petroleum Engineer

c.c. Administration



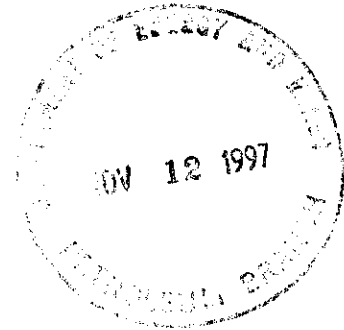
Saskatchewan  
Energy and Mines

1914 Hamilton Street  
Regina, Canada  
S4P 4V4

(306) 787-7338 Telecopier / Fax

Petroleum and Natural Gas Division  
November 7, 1997

Mr. John Fox  
Manitoba Energy and Mines  
1395 Ellice Avenue  
Winnipeg, Manitoba  
R3G 3P2



Dear Mr. Fox:

**Re:   Anderson S. Pierson 5-30-2-29 W1M**  
**Application for Off-target Penalty Relief**

Thank you for your letter of November 5, 1997, informing us of the proposed off-target well on 5-30-2-29 W1M, where Anderson is requesting penalty relief.

The Saskatchewan Department of Energy and Mines has no objections to the penalty relief in view of the fact that the freehold royalty owners on section 25-2-30 W1M have provided their consent.

I trust that if a similar situation arises on the Saskatchewan side of the border, Manitoba Energy and Mines will reciprocate.

Yours very truly,

A handwritten signature in black ink, appearing to read "Myron Sereda".

Myron Sereda, Director  
Engineering Services Branch

# FAX

Date

05-NOV-97

Number of pages including cover sheet

4

TO:

BRONT ARNELL  
ANDERSON EXPLORATION

Phone (403)

Fax Phone 232-7578

CC:

FROM:

John Fox, P.Eng.  
Manitoba Energy & Mines  
Petroleum & Energy Branch  
360, 1395 Ellice Avenue  
Winnipeg MB R3G 2P3

Phone 945-6574

Fax Phone 945-0586

e-mail jfox@em.gov.mb.ca

REMARKS:

☐ Urgent

☐ For your review

☐ Reply ASAP

☐ Please Comment

5-30-2-29

SPACING & OFF-TARGET  
APPLICATION.

BRONT ARNELL BY PHONE 28-NOV-97  
INDICATE ANDERSON APPROVES THE  
SPACING ORBIT MODIFICATIONS  
SUGGESTED BY THE BRANCH.

J.



Energy and Mines

Petroleum and Energy Branch

1395 Ellice Avenue Suite 360  
Winnipeg MB R3G 3P2  
CANADA

PH: (204) 945-6577  
PH: (204) 945-3760  
FAX: (204) 945-0586

Mr. Brent Arnell  
Anderson Exploration  
1600, 324 Eighth Avenue SW  
Calgary AB T2P 2Z5

Dear Brent:

**Re: Application of Waiver of Off-Target Penalty & Amendment of Board Order No. SU 9  
Anderson Pierson 5-30-2-29 (WPM)**

The Branch has completed a preliminary review of your application to reduce spacing in the W/2 of the SW/4 of Section 30-2-29 (WPM) and for waiver of the off-target penalty for the well to be drilled at 5-30-2-29 (WPM).

A copy of the application for waiver of the off-target penalty has been forwarded to Saskatchewan Energy and Mines for their comments. A copy of the Branch's letter to Saskatchewan Energy and Mines is attached for your reference. Anderson is requested to submit copies of the leases covering the E/2 of Section 25-2-30 (WPM).

Anderson has also applied to modify Board Order No. SU 9 to reduce spacing in the W/2 of the SW/4 of Section 30-2-29 (WPM) and indicated that 32 ha spacing should be continued for the remainder of the area covered by the order because of potential offset obligations. The Branch proposes to further reduce the 32 ha spacing area covered by Board Order No. SU 9 to exclude those areas where offset obligations do not appear to be an issue (see Figure 1). The following areas are proposed to be excluded:

- (a) The W/2 of the SW/4 of Sec. 30, as requested by Anderson.
- (b) Crown lands in the SW/4 of Section 11, SW/4 of Section 14 and SW/4 & Lsd's 12 & 13 of Section 20. Anderson is no longer the lessee of a portion of these lands. The Branch will not call any offsets on the remainder of the Crown lands in question before the end of the current term of the leases, which expire between May - October 1997.
- (c) Freehold lands in the S/2 of Section 10 and Lsd's 11 & 14 of Section 15, where the mineral owners have not called any offset obligations on undrilled 32 ha spacing units.

Please provide the Branch with your comments on the proposed amendments to Board Order No. SU 9. If you have any questions don't hesitate to call me at (204) 945-6574.

Yours truly,

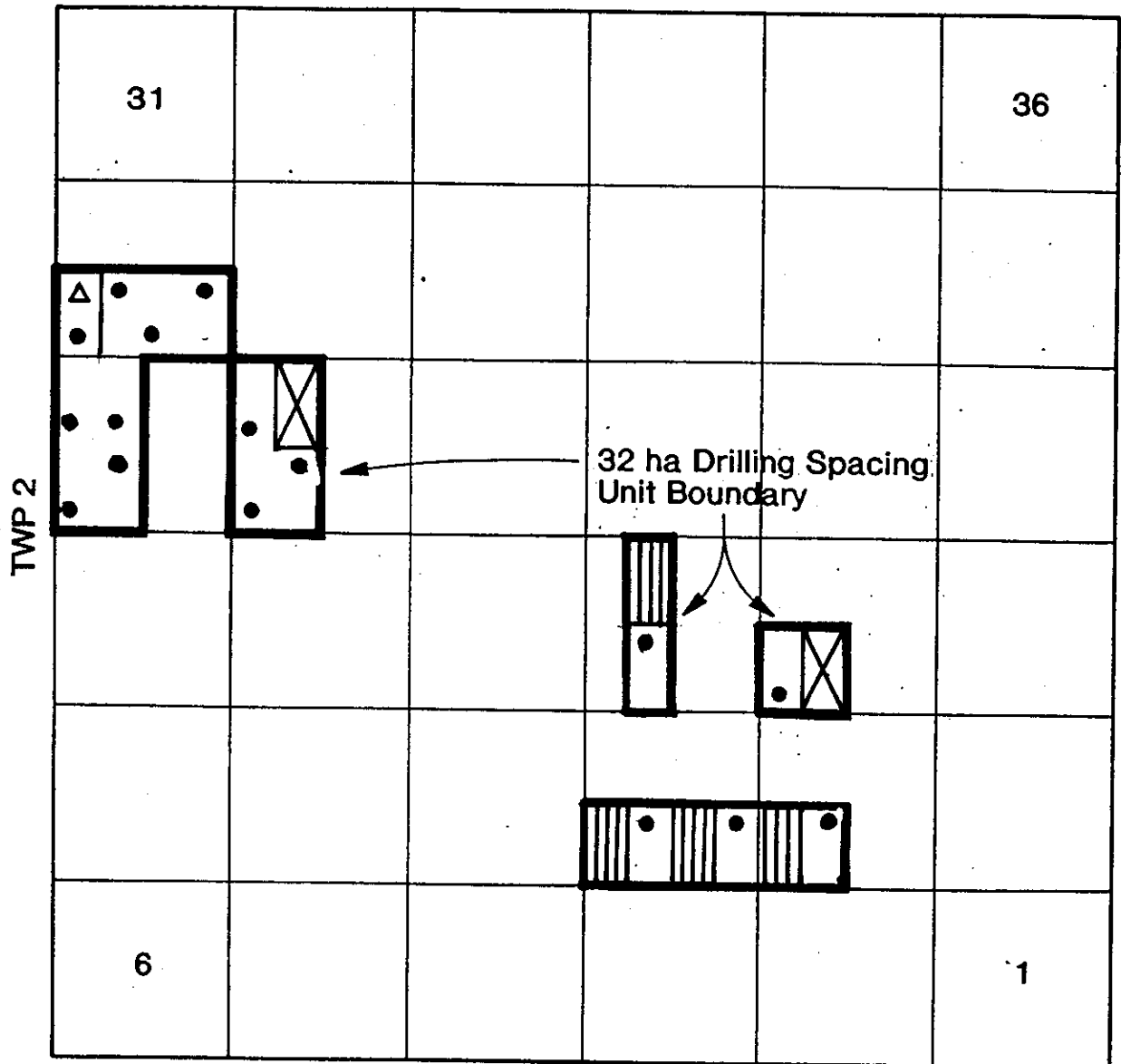
John N. Fox, P.Eng.  
Chief Petroleum Engineer

cc. Administration



# BOARD ORDER NO. SU 9 SCHEDULE A - REVISED

## PIERSON AREA 32 ha DRILLING SPACING UNITS LOWER AMARANTH AND MISSION CANYON FORMATIONS



RGE 29 (WPM)



CROWN LAND, WHERE ANDERSON NO LONGER THE LESSEE



UNDRILLED 32 ha SPACING UNITS, WHERE NO OFFSET HAS BEEN CALLED

EFFECTIVE DATE: November 24, 1995

APPROVED: *[Signature]*  
Director of Petroleum for Minister Energy and Mines

DATE: Nov. 24, 1995

Δ PROPOSED LOCATION 5-30-2-29, 16 ha SPACING APPLIED FOR



Energy and Mines

Petroleum and Energy Branch

1395 Ellice Avenue Suite 360  
Winnipeg MB R3G 3P2  
CANADA

Faxed

PH: (204) 945-6577  
PH: (204) 945-3760  
FAX: (204) 945-0586

November 5, 1997

Mr. Myron Sereda  
Saskatchewan Energy and Mines  
1914 Hamilton Street  
Regina SK S4P 4V4

**Re: Application for Off-Target Penalty Relief**

Anderson Exploration has applied to Manitoba Energy and Mines for waiver of the off-target penalty for a well to be drilled at 5-30-2-29 (WPM), adjacent to the Manitoba/Saskatchewan border. A copy of the application is attached for your reference.

The target area for standard 16 ha spacing in Manitoba is a square 100 m from and parallel to the LSD boundaries. Anderson's proposed well is located 25 m east of the target area toward the border (see Figure 1).

Anderson is the working interest owner in Section 25-2-30 (WPM) and the royalty owners, Kleinman and Odlaug, have consented to the off-target location. The Branch has asked Anderson to submit a copy of the subject leases for verification. In Manitoba, the Branch will automatically grant a waiver of the off-target penalty in two situations, where correlative rights concerns are satisfied:

- (1) where the well is off-target toward lands of common royalty and working interest ownership; and
- (2) as in this case, where the well is off-target towards lands of different royalty and/or working interest ownership and the offsetting owners consent to the waiver.

Anderson has asked for a quick turnaround on its application because they currently have a rig drilling in the area. Please provide me with any concerns you have with the application before November 13, 1997. If you have any questions don't hesitate to call me at (204) 945-6574.

Yours truly,



John N. Fox, P.Eng.  
Chief Petroleum Engineer

cc. Brent Arnell, Anderson Exploration

# ANDERSON EXPLORATION

97/10/29

Manitoba Energy and Mines  
Petroleum Branch  
555 - 330 Graham Avenue  
Winnipeg, Manitoba  
R3C 4E5

ATTENTION: Mr. L.R. Debreuil  
Director, Petroleum Branch

Dear Sir:

**Re: Application for Waiver of Off-Target Penalty  
Application for Special DSU  
Anderson South Pierson 5-30-002-29W1**

Anderson Exploration hereby applies for waiver of any off target penalty for a proposed oilwell at 5-30-002-29W1. The well will be located at 75 meters west and 620 meters north of the SW corner of section 30-002-29W1. The primary target for the well is a seismic anomaly in the Mission Canyon formation. The Lower Amaranth is a secondary target. Moving the well to inside the normal target area for a single lsd drilling spacing unit would increase the risk of an uneconomic well based on our interpretation of a 3D seismic survey.

We also make application to reduce the approved drilling spacing unit from the current 32 hectares to 16 hectares for lsd 4 and 5-30-002-29W1. We believe that this spacing is appropriate for this small area because of the combination of Mission Canyon and Lower Amaranth reserve potential. This makes drilling under primary production economically viable.

In other areas with 32 hectare spacing, infill drilling is unattractive without potential waterflood recovery because the Lower Amaranth is the primary target. Waterflood response in the South Pierson Unit is unclear at this point in time. Recent optimization work including 12 well workovers and a new water source well, all completed in the last 18 months, may soon have a positive effect which would encourage expansion of the waterflood to these 32 hectare spacing units. At this point in time we are not able to justify this expansion and request that no other changes be made to existing spacing so that we are not faced with premature investment decisions relating to offset obligations in our lease agreements.

time frame  
rig in area for  
the month

John

① who are Kleen man  
- affecting mineral  
owners

② suggest we still  
need to inform Sask  
of our intention to  
approve

③ I suspect the well  
is 75 m east of the  
SW corner of section 30  
West as indicated  
Proposed 30

1600, 324 Eighth Avenue S.W.  
Calgary, Alberta T2P 2Z5  
Phone: (403) 232-7100

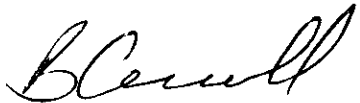
mined  
section 25-2-30

review  
lease  
agreements

Please find attached letters of consent for drilling the 5-30 well from offsetting mineral owners in section 25-002-30W1. If more information is required please contact the Brent Arnell at (403) 232-5524.

Yours truly,

ANDERSON EXPLORATION

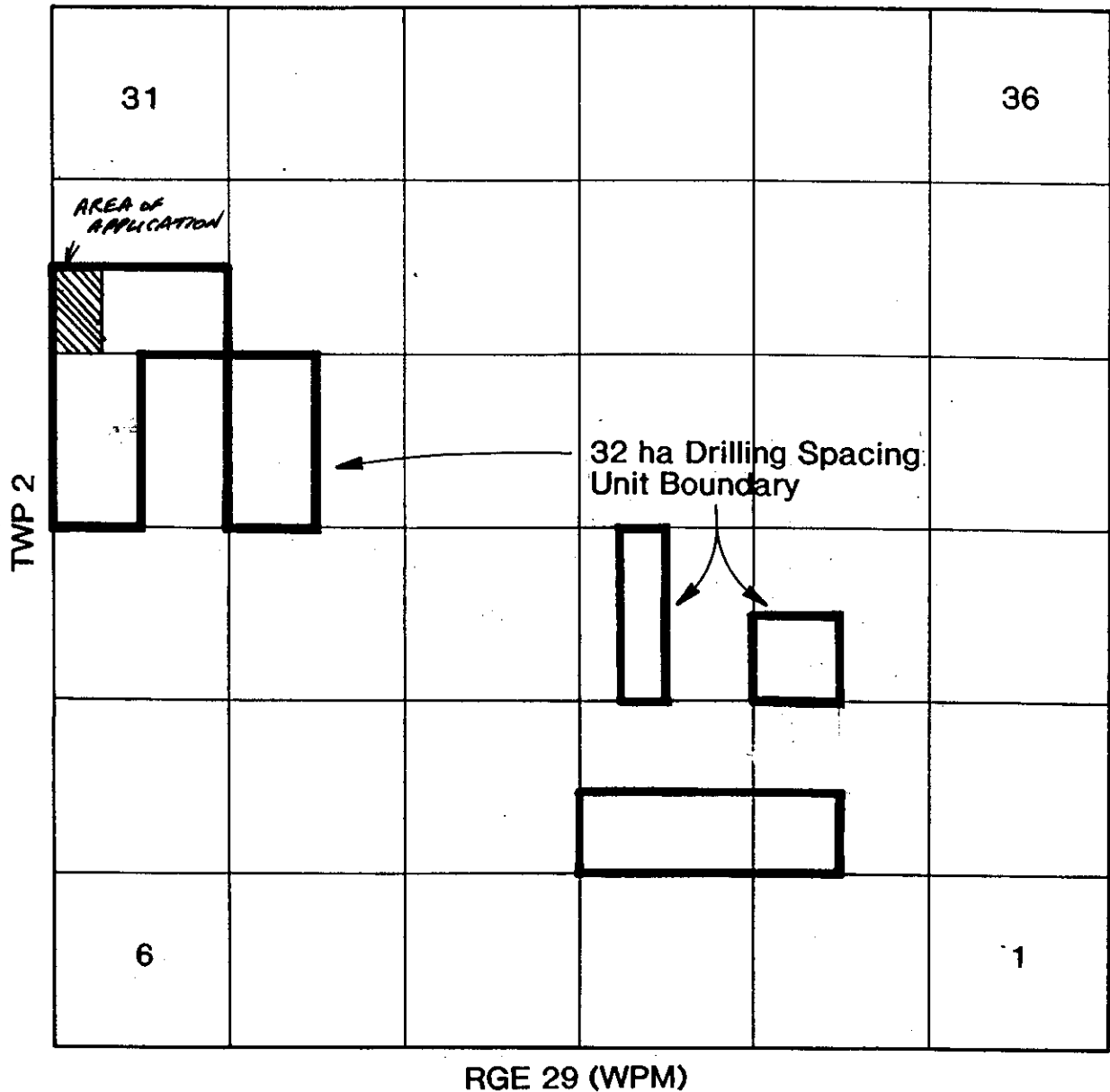
A handwritten signature in black ink, appearing to read 'B. Arnell', written in a cursive style.

Brent Arnell  
Exploitation Department

Attachments

BOARD ORDER NO. SU 9  
SCHEDULE A - REVISED

PIERSON AREA  
32 ha DRILLING SPACING UNITS  
LOWER AMARANTH AND MISSION CANYON FORMATIONS



EFFECTIVE DATE: November 24, 1995


APPROVED: *A. Dubreuil*  
Director of Petroleum for Minister Energy and Mines

DATE: Nov. 24, 1995

# ANDERSON EXPLORATION

1600, 324 Eighth Avenue S.W.  
Calgary, Alberta T2P 2Z5  
Phone: (403) 232-7100

September 29, 1997



Robert J. Kleinman Jr.  
Suite 109, 1409 Willow Street  
Minneapolis, Minnesota, U.S.A.  
55403

Bruce Garland Odlaug  
1324 Laura Street  
Mendota Heights, Minnesota, U.S.A.  
55118

Dear Sirs:

**RE: WAIVER OF OFF-TARGET LOCATION  
OUR FILES: M05808 and M05809**

Anderson Exploration is currently completing a drilling program in Twp. 2, Rge. 30, WPM. In the near future, we plan to move the drilling rig we have been using to a location at 5-30-2-29 WPM, which is off-target (as opposed to on-target).

An on-target location is a specific location in a section where a company is normally required to drill by government regulation. The purpose of the regulation is to provide for orderly development and conservation. However, our preferred location in 5-30 (which we feel is the best location to be successful) is off-target.

Normally Anderson would approach both Manitoba Energy & Mines and Saskatchewan Energy & Mines and request an off-target waiver. This process usually takes a minimum of thirty (30) days. The Saskatchewan and Manitoba governments then contact any mineral owners that have an interest in the adjacent lands. Anyone who has a vested interest can object; usually nobody does.

You should be aware that any unnecessary delay to our drilling program will obviously be more expensive and we run a real risk of losing the rig, which will jeopardize the remainder of our program. The only alternative, is to provide the Crown with written confirmation from each lessor that you do not object to an off-target location.

If our off-target location is successful, additional wells may be drilled in the area, which of course, could be beneficial for all concerned.

**ANDERSON**  
EXPLORATION

Robert J. Kleinman, Jr.  
Bruce Garland Odlaug  
September 29, 1997  
Page 2

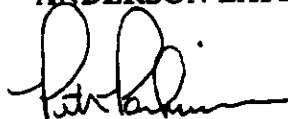
---

In order to keep our rig moving, we must obtain a drilling licence from the Crown by October 13, 1997 and provide them with written confirmation of your agreement to waive any off-target location.

If you are agreeable to any off-target waiver, would you please date and sign, in the space provided, and return to Anderson by mail and fax (if possible) at (403) 232-7429. Should you have any questions, please call me collect at (403) 232-5583.

Yours truly,

**ANDERSON EXPLORATION**



P. C. (Peter) Parkinson  
Landman

PCP:dn  
Encl.

cc: Brent Arnell

I / We agree and consent to any off-target waiver required by  
Anderson Exploration dated this 7<sup>TH</sup> day of October, 1997.



Robert J. Kleinman, Jr.

Bruce Garland Odlaug

j:\winword\pcp\letters\kleinma.001

**ANDERSON**  
EXPLORATION

Robert J. Kleinman, Jr.  
Bruce Garland Odlaug  
September 29, 1997  
Page 2

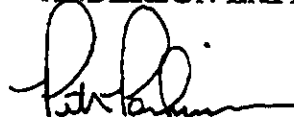
---

In order to keep our rig moving, we must obtain a drilling licence from the Crown by October 13, 1997 and provide them with written confirmation of your agreement to waive any off-target location.

If you are agreeable to any off-target waiver, would you please date and sign, in the space provided, and return to Anderson by mail and fax (if possible) at (403) 232-7429. Should you have any questions, please call me collect at (403) 232-5583.

Yours truly,

**ANDERSON EXPLORATION**



P. C. (Peter) Parkinson  
Landman

PCP:dn  
Encl.

cc: Brent Arnell

I / We agree and consent to any off-target waiver required by  
Anderson Exploration dated this 7<sup>th</sup> day of October, 1997.

  
Robert J. Kleinman, Jr.  
Bruce Garland Odlaug

j:\winword\pdp\letters\klc\clmna.001



# ANDERSON EXPLORATION

1600, 324 Eighth Avenue S.W.  
Calgary, Alberta T2P 2Z5  
Phone: (403) 232-7100

97/11/18

Manitoba Energy and Mines  
Petroleum Branch  
360, 1395 Ellice Avenue  
Winnipeg, Manitoba  
R3C 2P3

ATTENTION: Mr. John Fox  
Chief Engineer, Petroleum Branch

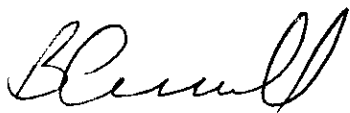
Dear Sir:

**Re: Application for Waiver of Off-Target Penalty  
Application for Special DSU  
Anderson South Pierson 5-30-002-29W1**

Please find enclosed the lease agreements for the east half of Section 25-002-30W1, which are the lands directly offsetting the 5-30 drilling location. If more information is required please contact the Brent Arnell at (403) 232-5524.

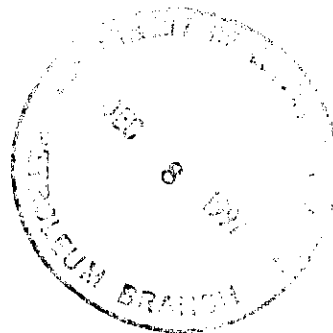
Yours truly,

ANDERSON EXPLORATION



Brent Arnell  
Exploitation Department

Attachments



C-24886

C.A.P.L.  
91  
SASK.PETROLEUM AND NATURAL GAS LEASE  
93081 - 1C

This Indenture made on the 24th day of November, 1993

BETWEEN ROBERT J. KLEINMAN, Jr., of Minneapolis, in the State of Minnesota, one of the United States of America, as Executor of the Last Will and Testament of Robert J. Kleinman, Deceased,

(herein called the "Lessor")

-AND-

HOME OIL COMPANY LIMITED, a body corporate, having an office at the city of Calgary, in the Province of Alberta.

(herein called the "Lessee")

THE LESSOR, being registered as owner, or entitled to become registered as owner of the leased substances (as hereinafter defined) within, upon or under that certain parcel or tract of land legally described as follows:

All mines and minerals within, upon or under the South East (SE) Quarter of Section Twenty-five (25) in Township Two (2), Range Thirty (30), West of the Principal Meridian (WPM).

as more particularly described and set forth in Certificate(s) of Title No. 62R24840 (herein called the "said lands") in consideration of the sum of \$10.00 paid to the Lessor by the Lessee, the receipt of which is hereby acknowledged by the Lessor, and of an additional consideration of ~~Four Thousand Eight Hundred Canadian Funds~~ Dollars

(\$ 4,800.00) to be paid within 90 days of the date hereof and in consideration of the covenants of the Lessee hereinafter contained, HEREBY GRANTS AND LEASES exclusively unto the Lessee all the leased substances (as hereinafter defined) subject to the royalties hereinafter reserved, within, upon or under the said lands, together with all of the present or future right, title, estate and interest, if any, of the Lessor in and to the leased substances or any of them within, upon or under any lands excepted from the said lands and any roadways, lanes or rights of way adjoining the said lands; together with the exclusive right and privilege to explore for, drill for, operate for, produce, win, take, remove, store, treat and dispose of the leased substances and the right to inject substances into the said lands for the purpose of obtaining, maintaining or increasing production from the said lands, the pooled lands or the unitized lands and to store and recover any such substances injected into the said lands.

TO HAVE AND ENJOY the same for the term of five (5) years (herein called the "primary term") commencing on the date hereof and continuing so long thereafter as operations (as hereinafter defined) are conducted upon the said lands, the pooled lands or the unitized lands, with no cessation, in the case of each cessation of operations, of more than 90 consecutive days.

THE LESSOR AND THE LESSEE HEREBY COVENANT AND AGREE AS FOLLOWS:

## 1. INTERPRETATION

In this Lease the following expressions shall have the following meanings:

- (a) "anniversary date" means the date corresponding to the date first above written in each year during which this Lease remains in force;
- (b) "commercial production" means the output from a well of such quantity of the leased substances or any of them as, considering the cost of drilling and production operations and price and quality of the leased substances, after a production test of suitable duration and nature in accordance with good oil field practice, would commercially and economically warrant the drilling of a like well in the vicinity thereof;
- (c) "force majeure" means any cause beyond the Lessee's reasonable control and, without limitation, includes an act of God, strike, lockout, or other industrial disturbance, act of any public enemy, war, blockade, riot, lightning, fire, storm, flood, explosion, unusually severe weather conditions, government restraints, including road bans, but shall not include lack of finances;
- (d) "lease year" means a period of one year commencing on the date first above written or any anniversary date and ending at midnight of the day immediately preceding the next anniversary date;
- (e) "leased substances" means all petroleum, natural gas and related hydrocarbons (except coal), and all materials and substances (except valuable stone), whether liquid, solid or gaseous and whether hydrocarbons or not, produced in association with petroleum, natural gas or related hydrocarbons or found in any water contained in any reservoir;
- (f) "offset well" means any well drilled on any spacing unit laterally adjoining the said lands, which spacing unit does not include lands owned by the Lessor or, if owned by the Lessor, not under lease to the Lessee;
- (g) "operations" means any of the following:
  - (i) drilling, testing, completing, reworking, recompleting, deepening, plugging back or repairing a well or equipment on or in the said lands or injecting substances by means of a well, in search for or in an endeavor to obtain, maintain or increase production of any leased substance from the said lands, the pooled lands or the unitized lands;
  - (ii) the production of any leased substance;
  - (iii) the recovery of any injected substance; or
  - (iv) any acts for or incidental to any of the foregoing;
- (h) "pooled lands" means all or any portion of the said lands and such other lands as may have been pooled, which pooling shall not exceed a spacing unit, in accordance with the terms hereof or pursuant to any agreement, or any statute, regulation, order or directive of any government or any governmental agency;
- (i) "rental" shall have the meaning given in paragraph 2;
- (j) "said lands" means all the lands and all zones and formations underlying the lands described above as the "said lands", or such portion or portions thereof as shall not have been surrendered;
- (k) "spacing unit" means the area allocated to a well from time to time on or in the vicinity of the said lands, for the purpose of drilling for or producing, as the case may be, the leased substances or any of them, as defined or prescribed by or under any statute, regulation, order or directive of any government or any governmental agency;
- (l) "suspended well payment" shall have the meaning given in paragraph 3;
- (m) "unitized lands" means all or any portion of the said lands and such other lands as may have been unitized in accordance with the terms hereof or pursuant to any agreement, statute, or any regulation, order or directive of any government or any governmental agency;
- (n) "Unit Agreement" means any agreement for the development or operation of all or any portion of the said lands together with other lands as a single unit without regard to separate ownership and for the allocation of costs and benefits on a basis as defined in the agreement.

RENTALS (Strike out inapplicable clause.)

~~Lump Sum~~  
The Lessee shall, on or before the date on which the additional consideration provided for above is payable, pay to the Lessor a sum (herein called the "rental") equal to the sum of \_\_\_\_\_ Dollars (\$ \_\_\_\_\_).

Periodic Payments

If operations are not commenced on the said lands, the pooled lands or the unitized lands during the first lease year, the Lessee shall, on or before the expiration of the first lease year, pay or tender to the Lessor a sum (herein called the "rental") of ~~one hundred sixty~~ \_\_\_\_\_ Dollars (\$ \_\_\_\_\_) as the annual rental for the next ensuing lease year of the primary term. If operations are not commenced on the said lands, the pooled lands or the unitized lands during any successive lease year during the primary term, the Lessee shall make like payments or tenders on or before the expiration of that year. For greater certainty, no rental shall be paid on the expiry of the primary term.

## 3. SUSPENDED WELLS

If, at the expiration of the primary term or at any time or times thereafter, there is any well on the said lands, the pooled lands, or the unitized lands, capable of producing the leased substances or any of them, and all such wells are shut-in or suspended, this Lease shall, nevertheless, continue in force as though operations were being conducted on the said lands, for so long as all the said wells are shut-in or suspended and so long thereafter as operations are conducted upon the said lands, the pooled lands or the unitized lands, with no cessation, in the case of each cessation of operations, of more than 90 consecutive days. If no royalties are otherwise payable hereunder during a lease year after the primary term within which such shut-in period or periods occur and during such lease year no other operations are conducted on the said lands, the pooled lands, or the unitized lands then the Lessee shall pay to the Lessor an amount equal to ~~one hundred sixty (\$160.00)~~ \_\_\_\_\_ Dollars (\$ \_\_\_\_\_) within 90 days after the expiry of such lease year (herein called the "suspended well payment").

**4. ROYALTIES**

(a) The Lessee shall pay the Lessor a royalty in an amount equal to the current market value at the wellhead as and when produced of Fifteen percent (15%) of all the leased substances produced, saved and sold, or used by the Lessee for a purpose other than that described in subclause (b) hereof, from the said lands; provided that in computing the current market value at the wellhead of all the leased substances produced, saved and sold, or used by the Lessee for a purpose other than that described in subclause (b) hereof, the Lessee may deduct any reasonable expense incurred by the Lessee (including a reasonable rate of return on investment) for separating, treating, processing, compressing and transporting the leased substances to the point of sale beyond the wellhead or, if the leased substances are not sold by the Lessee in an arm's length transaction, to the first point where the leased substances are used by the Lessee for a purpose other than that described in

subclause (b) hereof; provided further, however, that the royalty payable to the Lessor hereunder shall not be less than Sixty percent (60%) of the royalty that would have been payable to the Lessor if no such expenses had been incurred by the Lessee. In no event shall the current market value be deemed to be in excess of the value actually received by the Lessee pursuant to a bona fide, arm's length sale or transaction. The royalty as determined under this clause shall be payable on or before the 15th day of the second month following the month in which the leased substances, with respect to which the royalty is payable, were produced, saved and sold, or used by the Lessee for a purpose other than that described in subclause (b). No royalty shall be payable to the Lessor with respect to any substance injected into and recovered from the said lands, other than leased substances originally produced from the said lands for which a royalty has not been paid or payable.

(b) Notwithstanding anything to the contrary herein contained or implied, the Lessee shall be entitled to use such part of the production of leased substances from the said lands as reasonably may be required and used by the Lessee in its operations hereunder on the said lands, the pooled lands or the unitized lands and the Lessor shall not be entitled to any royalty with respect to leased substances so used.

(c) The Lessor agrees that the royalty reserved and payable hereunder in respect of the leased substances shall be inclusive of any prior disposition of any royalty or other interest in the leased substances, and agrees to make all payments required by any such disposition out of the royalty received hereunder and to indemnify and save the Lessee harmless from its failure to do so; provided, however, that the Lessee may elect by notice in writing to the Lessor to make such payments on behalf of the Lessor and shall have the right to deduct any such payments made from the royalty, rental and suspended well payments otherwise payable to the Lessor.

(d) The Lessee shall make available to the Lessor during normal business hours at the Lessee's address for notice, the Lessee's records relating to the leased substances produced from or allocated to the said lands.

**5. LESSOR INTEREST**

If the Lessor's interest in the leased substances is less than the entire and undivided fee simple estate, the royalties, rentals and suspended well payments herein provided shall be paid to the Lessor only in the proportion which such interest bears to the entire and undivided fee.

**6. TAXES PAYABLE BY THE LESSOR**

The Lessor shall promptly pay all taxes, rates and assessments that may be assessed or levied, directly or indirectly, against the Lessor by reason of the Lessor's interest in production of leased substances obtained from the said lands, or the Lessor's ownership of the leased substances.

**7. TAXES PAYABLE BY THE LESSEE**

The Lessee shall pay all taxes, rates and assessments that may be assessed or levied in respect of the operations of the Lessee on, in, over or under the said lands, and shall further pay all taxes, rates and assessments that may be assessed or levied directly or indirectly against the Lessee by reason of the Lessee's interest in production of leased substances from the said lands. The Lessee shall on the written request of the Lessor, accompanied by such tax receipts, statements or tax notices as the Lessee may require, reimburse the Lessor for Eighty-Five percent (85%) of any taxes assessed or imposed on the Lessor while this Lease remains in force by reason of the Lessor being the registered owner of the leased substances or being entitled to become such owner; provided that the Lessee shall, at the written request of the Lessor, pay the Lessor's said percentage of said tax and be reimbursed from any sums payable to the Lessor under this Lease.

**8. OFFSET WELLS**

If commercial production is obtained after the date of this Lease from an offset well, then unless (i) a well has been or is being drilled on the spacing unit of the said lands laterally adjoining the spacing unit of the offset well and into the zone or formation from which commercial production is being obtained from the offset well, or (ii) all or part of the spacing unit of the said lands laterally adjoining the spacing unit of the offset well has been pooled or included in a unit in which the pooled or unitized substances include production from the same zone or formation from which production is being obtained from the offset well, the Lessee shall within 6 months from the later of the date of the offset well being placed on commercial production or, if information with respect to the amount of production from the offset well is restricted pursuant to any statute, regulation, order or directive of any government or governmental agency and such information is unknown to the Lessee, until one month after such information is made public, or within 6 months from notice thereof being given to the Lessee in writing by the Lessor, (a) commence or cause to be commenced operations for the drilling of a well on the spacing unit of that portion of the said lands which comprises or is included in the spacing unit laterally adjoining the spacing unit of the offset well and thereafter drill, or cause to be drilled the same to the zone or formation from which production is being obtained from the offset well;

(b) pool or unitize that portion of the said lands which comprises or is included in the spacing unit laterally adjoining the spacing unit of the offset well, such that the unitization to include production from the same zone or formation from which the offset well is being produced;

(c) surrender all or any portion of the said lands pursuant to the provisions hereof, provided that the surrender shall include but may be limited to the zone or formation from which production is being obtained from the offset well underlying that portion of the said lands which comprises or is included in the spacing unit laterally adjoining the spacing unit of the offset well; or

(d) pay to the Lessor at such times as royalty would be payable pursuant to the provisions of this Lease, until the provisions of paragraphs (a), (b) or (c) of this clause are met, a royalty which shall be proportionately equivalent on an acreage basis to such royalty as would have been payable to the Lessor if the leased substances produced from the offset well were actually being produced from a well on the said lands which commenced production on the last day of the said 6-month period; provided however, that should any spacing unit of the said lands laterally adjoin more than one spacing unit upon which is located an offset well from which commercial production is being obtained, the royalty which the Lessee may elect to pay to the Lessor pursuant to this subclause shall be calculated on the average of the production from the said offset wells, such average to be calculated by dividing the total production from all of the said offset wells by the number of all of the said offset wells.

Notwithstanding anything herein contained, the obligations imposed by this clause shall be deemed not to have arisen if (a) the offset well shall cease to be capable of or ceases commercial production during the said 6-month period, or (b) the offset well is productive primarily or only of natural gas and the Lessee has not previously arranged an adequate and commercial market for the natural gas which might be produced from any well to be drilled pursuant to this clause.

**9. POOLING AND UNITIZATION**

(a) The Lessee is hereby given the right and power at any time and from time to time during and after the primary term to pool the said lands, or any portion thereof, or any zone or formation underlying the said lands or any portion thereof, or any of the leased substances therein, with any other lands or any zone or formation underlying such other lands or any portion thereof, or any of the leased substances therein, but so that the other lands or any zone or formation thereof, together with the said lands or any zone or formation thereof, shall not exceed one spacing unit. The Lessee shall thereafter give written notice to the Lessor describing the extent to which the said lands are being pooled and describing the spacing unit with respect to which they are so pooled. In the event of pooling there shall be allocated to that portion of the said lands included in the spacing unit that proportion of the total production of the leased substances from the spacing unit, after deducting any leased substances used in operations on the pooled lands, which the surface area of that portion of the said lands placed in the spacing unit bears to the total surface area of the lands in the spacing unit. The production so allocated shall be considered for all purposes, including the payment of royalty, to be the entire production of the leased substances from the portion of the said lands included in the pooling in the same manner as though produced from the said lands under the terms of this Lease.

(b) The Lessee may terminate any pooling pursuant to subclause (a) of this clause and thereafter shall give written notice to the Lessor.

(c) If the spacing unit pooled under this clause is varied or terminated by any statute, regulation, order or directive of any government or governmental agency, or if the pooling is terminated or invalidated by reason of the termination or expiration of a lease covering any lands, other than the said lands, within the spacing unit, or any other cause beyond the Lessee's reasonable control, and this Lease would otherwise terminate as a result of such variation or termination of the spacing unit or such termination or invalidation of the pooling, this Lease shall nonetheless continue in force for a period of 90 days after the Lessee receives notice that the spacing unit has been varied or terminated or the pooling has been terminated or invalidated and the term of the Lease may be extended further pursuant to other provisions of this Lease, including without limitation the commencement of operations, within the said 90-day period.

(d) The Lessee is hereby given the right and power at any time and from time to time during and after the primary term to include the said lands or any portion thereof or any zone or formation underlying the said lands or any portion thereof, or any of the leased substances therein, in a Unit Agreement for the unitized development or operation thereof with any other lands, or any zone or formation underlying such other lands, or any of the leased substances therein, if such becomes necessary or desirable in the opinion of the Lessee. The Lessee shall thereafter give written notice to the Lessor stating that the said lands are being or have been unitized. The basis and manner of any such unitization, the manner of allocating unitized production among the several tracts of unitized lands, and the contents of any such Unit Agreement shall be in the sole discretion and determination of the Lessee, exercised bona fide, and when so determined shall be binding upon the Lessor.

(e) In the event of unitization, the production of leased substances which are unitized shall be allocated to that portion of the said lands included in the unit in accordance with the terms of the Unit Agreement. The production so allocated shall be considered for all purposes, including the payment of royalty, to be the entire production of the leased substances from the portion of the said lands included in the unit in the same manner as though produced from the said lands under the terms of this Lease. Upon notice from the Lessor, the Lessee shall provide the Lessor with a copy of the Unit Agreement within a reasonable time after the right and power granted hereunder has been exercised. The Lessee shall also have the right and power to withdraw the said lands, or any portion or portions of the said lands or the leased substances, from the Unit Agreement and shall give the Lessor written notice thereof.

(f) Any operations conducted on the pooled lands or the unitized lands, whether conducted before, after or during the exercise of the rights and powers granted under this clause, or the presence of a shut-in or suspended well on the pooled lands or the unitized lands, shall have the same effect in continuing this Lease in force and effect during the term hereby granted or any renewal or extension thereof as if such operations were upon the said lands, or as if said shut-in or suspended well were located on the said lands.

**10. CONDUCT OF OPERATIONS**

The Lessee shall conduct all operations on the said lands in a diligent, careful and workmanlike manner and in compliance with the provisions of any statutes, regulations, orders or directives of any government or governmental agency applicable to such operations, and where such provisions conflict with the terms of this Lease, such provisions shall prevail.

**11. INDEMNIFICATION**

The Lessee shall indemnify the Lessor against all actions, suits, claims and demands by any person or persons whomsoever in respect of any loss, injury or damage arising out of or connected with any operations carried out by the Lessee on the said lands, the pooled lands, or the unitized lands unless such loss, injury or damage was caused by the act or omission of the Lessor, its agents, employees or contractors.

**12. DISCHARGE OF TAXES AND ENCUMBRANCES**

The Lessee may at the Lessee's option pay or discharge the whole or any portion of any withholding or other tax, charge, mortgage, lien or encumbrance payable, incurred or created by the Lessor or the Lessor's predecessors or successors in title or interest which may now or hereafter exist on or against or in any way affect the said lands or the leased substances, in which event the Lessee shall be subrogated to the rights of the holder or holders thereof and, at the Lessee's option, may reimburse itself by applying the amount so paid by the Lessee against the consideration payable hereunder, the rentals, suspended well payments, royalties, or other sums accrued or accruing to the Lessor under the terms of this Lease, and any sums so applied shall, for all purposes of this Lease, be deemed to have been paid to and received by the Lessor in payment of the consideration payable hereunder, rentals, suspended well payments, or royalties, or other sums accrued or accruing to the Lessor under the terms of this Lease, as the case may be.

### 13. SURRENDER

- (a) Notwithstanding anything herein contained, Lessee may, at any time or from time to time, by written notice to the Lessor, surrender this Lease as to the whole or any part of the leased substances or the said lands or both of them, and this Lease shall thereupon terminate as to the whole or any part of the leased substances or of the said lands or both of them so surrendered.
- (b) Upon the said termination, the Lessee shall be released from all obligations accrued or to accrue respecting the said lands or the leased substances or both of them so surrendered excepting accrued royalty, rentals, suspended well payments, taxes and assessments. Any rentals paid shall not be refunded.
- (c) Upon the said termination, suspended well payments and the obligation to pay rental and royalties shall be extinguished or proportionately reduced as the case may be; provided that if the Lessee surrenders all or any part of the said lands by zone or formation the rental hereinbefore specified shall not abate.

### 14. REMOVAL OF EQUIPMENT

The Lessee shall have at all times during the currency of this Lease and for a period of 6 months after its termination, the right to remove from the said lands all or any of its machinery, equipment, structures, pipelines, casing and materials whether placed upon, within or under the said lands.

### 15. DEFAULT

- (a) If, before or after the expiry of the primary term, the Lessor considers that the Lessee has not complied with any provision or obligation of this Lease, including but not limited to a failure to give notice or to pay in the manner specified any rental, suspended well payments, royalty or other sums for which specific provision is made in this Lease, the Lessor shall notify the Lessee in writing, describing in reasonable detail the alleged breach or breaches. The Lessee shall have 30 days after receipt of such notice to:
- remedy or commence to remedy the breach or breaches alleged by the Lessor, and thereafter diligently continue to remedy the same; or
  - commence and diligently pursue proceedings for a judicial determination as to whether the alleged acts or omissions constitute a breach or breaches on the part of the Lessee.
- (b) The performance of any act by the Lessee intended to remedy all or any of the alleged breaches shall not be deemed an admission by the Lessee that it has failed to perform its obligations hereunder. If the Lessee fails to remedy or commence to remedy a breach or breaches within the 30-day period, or if having so commenced to remedy a breach or breaches thereafter fails to continue diligently to remedy the same, and if proceedings have not been commenced for a judicial determination as aforesaid, this Lease, except for the Lessee's right with respect to the removal of equipment and its obligation to remove any registered document in relation to this Lease, shall thereupon terminate and it shall be lawful for the Lessor to re-enter the said lands and to repossess them. If proceedings for a judicial determination are commenced within the aforesaid period of time, this Lease shall not terminate until the existence of such breach has been finally judicially determined; nor shall it terminate if the Lessee thereafter diligently continues to remedy the same.
- (c) Notwithstanding anything contained in this Lease, this Lease shall not terminate nor be subject to forfeiture or cancellation if there is located on the said lands or on the pooled lands or on the unitized lands a well capable of producing leased substances or any of them, or on which operations are being conducted; and, in that event, the Lessor's remedy for any default under this Lease shall be for damages only.

### 16. FORCE MAJEURE

- (a) If operations are interrupted or suspended or cannot be commenced as a result of force majeure, this Lease shall not terminate during any such period of interruption, suspension or inability to commence caused thereby or for 30 days thereafter.
- (b) If the Lessee is unable, in whole or in part, by force majeure to carry out its obligations hereunder, other than any obligation to make payment of any monies due hereunder, then the obligations of the Lessee, so far as they are affected by such force majeure, shall be suspended during the continuance of any inability so caused; and the cause of the force majeure so far as possible shall be remedied with all reasonable dispatch.
- (c) Nothing herein shall require the settlement of strikes, lockouts or other labour disturbances except in the sole discretion of the Lessee.

### 17. QUIET ENJOYMENT

The Lessor covenants and warrants that, subject only to such mortgages and encumbrances contained in the existing Certificate of Title, the Lessor has not disposed of the Lessor's interest in all or any part of the said lands and the leased substances, and has the right and full power to enter into this Lease and to grant and demise the said lands and the leased substances, and that the Lessee, upon observing and performing the covenants and conditions on the Lessee's part to be observed and performed, shall and may peaceably possess and enjoy the same during the primary term of this Lease and any extensions thereof without any interruption or disturbance from or by the Lessor or any person claiming under or through the Lessor.

### 18. FURTHER ASSURANCES

The Lessor and the Lessee shall each do and perform all such further acts and execute and deliver all such deeds, documents and writings and give all such further assurances as may be reasonably required in order to fully perform and carry out the terms of this Lease.

### 19. MANNER OF PAYMENT

- (a) All payments to the Lessor provided for in this Lease shall, at the Lessee's option, be paid or tendered either to the Lessor or to the depository named in or pursuant to this clause, and all such payments or tenders may be made by cheque or draft of the Lessee either mailed or delivered to the Lessor or to said depository, which cheque or draft shall be payable in Canadian funds. If payment is made by the Lessee to the depository, the Lessor does hereby appoint.....

Kleinman Realty Co., 1409 Willow Street, Suite 109, Minneapolis MN 55403

..... as the sole depository for the receipt of all monies payable under this Lease, and the Lessor agrees that said depository and its successors shall be and continue as its agent for the receipt of any and all sums payable hereunder, regardless of changes of ownership (whether by assignment, succession or otherwise and whether in whole or in part) of the said lands or the leased substances or of the consideration payable hereunder, rentals, suspended well payments or royalties to accrue hereunder. Any payment mailed to the Lessor or to the depository shall be deemed to have been paid 4 days (excluding Saturdays, Sundays and statutory holidays) after deposit in any mail box or post office.

- (b) The Lessor may not cancel the appointment of a depository without designating a successor but may at any time designate a new depository by giving written notice to the Lessee specifying the name and address of such new depository; provided that:
- only a bank, trust company, credit union, or treasury branch in Canada may be designated as a depository.
  - only one depository shall be designated at any one time, regardless of whether or not any monies payable hereunder are, or become, payable to more than one person, and
  - the Lessee shall not be required to recognize any new depository until the expiration of 45 days from the receipt by it of the notice in writing, but this shall not prohibit the Lessee from making payment to the new depository prior to the expiration of the 45-day period. All payments or tenders made to such new depository shall be deemed to have been made in accordance with the terms of this Lease.
- (c) If any depository shall at any time resign, or fail or refuse to act as the depository hereunder and a new depository is not designated by the Lessor pursuant to the terms of this clause within 10 days from such resignation, failure or refusal to act, then the Lessee at its option may designate a depository hereunder, which depository shall be entitled to charge its usual fees and collect same from the Lessor, and said depository shall be the depository to all intents and purposes as if originally appointed by the Lessor.
- (d) Should the Lessor be a non-resident of Canada, the Lessor acknowledges and agrees that the Lessee may deduct income, withholding or other taxes from any payment to the Lessor in compliance or intended compliance with the provisions of the Income Tax Act, tax agreements or treaties or other statutes of Canada or its Provinces as are from time to time enacted and amended, whereupon the timely remittance by the Lessee of the balance of the payment to the Lessor shall be deemed to constitute full performance by the Lessee in respect of such payment.

### 20. ASSIGNMENT

Each of the parties hereto may delegate, assign, sublet or convey to any other person, firm or corporation all or any of the property, powers, rights and interests obtained by or conferred upon them respectively by this Lease and may enter into all agreements, contracts and writings and do all necessary acts and things to give effect to the provision of this clause; provided that no assignment by the Lessor shall be binding upon the Lessee, notwithstanding any actual or constructive notice or knowledge thereof, unless and except when the same be for the entire interest of the Lessor. The Lessee need not act on any assignment until 45 days after the Lessee has been actually furnished with evidence satisfactory to it of such assignment. All payments made within the aforesaid period to the party or parties who would have been entitled to the same in the absence of such assignment shall be deemed to have been made in accordance with the terms of this Lease. The foregoing shall not, however, prohibit the Lessee from acting upon the assignment prior to the expiration of the aforesaid 45-day period and all payments or tenders made in accordance with such assignment shall be deemed to have been made in accordance with the terms of this Lease; provided further that if the Lessee shall assign this Lease as to any part or parts of the said lands, then the rental, suspended well payments and royalties shall be apportioned among the several lease holders rateably according to the surface area of each and should the assignee or assignees of any such part or parts fail to pay the proportionate part of the rental, suspended well payments and royalties payable by him or them, such failure to pay shall not affect this Lease insofar as it relates to and comprises the part or parts of the said lands in respect of which the Lessee or its assignees shall have made due payment.

### 21. NOTICES

- (a) All notices, communications and statements (herein called "notices") required or permitted hereunder shall be in writing. Notices may be served:
- personally by delivering them to the party on whom they are to be served at that party's address hereinafter given, provided such delivery shall be during normal business hours. Personally served notices shall be deemed received by the addressee when actually delivered as aforesaid; or
  - by telegraph or telecommunication (or by any other like method by which a written and recorded message may be sent) directed to the party on whom they are to be served at that party's address hereinafter given. Notices so served shall be deemed received by the respective addressees thereof (1) when actually received by them if received within the normal working hours of a business day, or (2) at the commencement of the next ensuing business day following transmission thereof, whichever is the earlier; or
  - by mailing them first class (air mail if to or from a location outside of Canada) post, postage prepaid, to the party on whom they are to be served. Notices so served shall be deemed to be received by the addressee at noon, local time, on the earlier of the actual date of receipt or the 4th day (excluding Saturdays, Sundays or statutory holidays) following the mailing thereof. No notice shall be effective if mailed during any period in which postal workers are on strike or if a strike of postal workers is imminent and may be anticipated to affect normal delivery of the notice.
- (b) The address for service of notices shall be as follows:

Lessee: 1600, 324 - 8th Ave. S.W.  
Calgary, Alberta T2P 2Z5

Lessor: 1409 Willow Street, Suite 109  
Minneapolis, Minnesota, USA  
55403

- (c) Any party may change its address for service by notice to the other party served as aforesaid.
- (d) Nothing herein shall in any way affect the method of the payment of monies as set out in clauses 19 and 20 of this Lease.

22. ENTIRE AGREEMENT

The terms of this Lease constitute the entire agreement between the parties, and no implied covenant or liability of any kind is created or shall arise by reason hereof or anything contained herein. This Lease supersedes and replaces all previous oral or written agreements, memoranda, correspondence or other communications between the parties relating to the subject matter hereof. The parties recognize that the terms of this Lease may be modified or affected by statute, regulation, order, or directive of any government or governmental agency.

23. NO AMENDMENT EXCEPT IN WRITING

No amendment or variation of the terms of this Lease shall be binding on any party unless it is evidenced in writing executed by the parties.

24. TIME OF THE ESSENCE

Time shall be of the essence.

25. ENUREMENT

This Lease shall enure to the benefit of and shall be binding upon the parties hereto and their respective heirs, executors, administrators, successors and assigns.

26. SEVERABILITY

If any provision hereof becomes illegal or unenforceable, the provision will be deemed to be severed and the Lease shall continue as amended.

IN WITNESS WHEREOF the Lessor and the Lessee have executed and delivered this Lease on the day and year first above written.  
SIGNED, SEALED AND DELIVERED  
by the Lessor in the presence of:

*Gail DeRoy*

Witness

Gail DeRoy

Witness

*David Scott*  
WITNESS

ROBERT J. KLEINMAN, Jr., as Executor of  
the Last Will and Testament of  
Robert J. Kleinman, Deceased.

Lessor

HOME OIL COMPANY LIMITED

Lessor

Per:  
BY ITS ATTORNEY ROBERT SIDNEY BACHYNSKI

Per:  
BY ITS ATTORNEY GORDON SCARTH MACLEOD

Lessee

AFFIDAVIT OF EXECUTION

I, Gail DeRoy of Minneapolis  
in the Province of Saskatchewan, State of Minnesota, USA make oath and say:  
(Occupation) ROBERT J. KLEINMAN, Jr.

1. THAT I was personally present and did see Minneapolis, in the state of Minnesota, USA  
named in the within instrument, who is (and) personally known to me to be the person(s) named therein, duly sign, seal and execute the same for the purposes  
named therein.

2. THAT the same was executed at Minneapolis, in the state of Minnesota, USA  
in the Province of Saskatchewan, and that I am the subscribing witness thereto.

3. THAT I know the said ROBERT J. KLEINMAN, Jr.  
and he (or she) is (or they are), in my belief, of the full age of eighteen years.

SWORN before me at Minneapolis  
State of Minnesota, USA 7th  
in the Province of Saskatchewan, this

day of December, A.D. 1993

*Gail DeRoy*

*Elizabeth Ann George*

A Commissioner for Oaths in and for the Province of Saskatchewan. A Notary Public in and for  
the State of Minnesota.

My Appointment Expires July 27, 1997  
ELIZABETH ANN GEORGE  
NOTARY PUBLIC-MINNESOTA  
HENNEPIN COUNTY

THE HOMESTEADS ACT AFFIDAVIT

I, My Commission Expires July 27, 1997, of Saskatchewan, make oath and say that

1. I am the/a Lessor named in the attached disposition.
2. My spouse and I have not occupied the land described in this disposition as our homestead at any time during our marriage.  
--- or ---
2. I have no spouse.  
--- or ---

FORM F  
(subsection 19(4) of the Act)

AFFIDAVIT OF PERSONAL REPRESENTATIVE

I, Robert J. Kleinman, Jr., of Minneapolis, in the State of Minnesota,  
MAKE OATH AND SAY THAT:

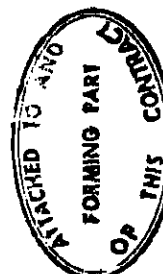
1. I am the Executor of the Last Will and Testament of Robert J. Kleinman, deceased, and as such a signator to the above-attached disposition.
2. No part of the land described in this disposition was occupied by the said Robert J. Kleinman, deceased, and his or her spouse as their homestead at any time during their marriage.

SWORN before me at Minneapolis,  
in the State of Minnesota, USA  
this 7th day of December  
A.D. 1993.

*Elizabeth Ann George*  
A Notary Public in and for the  
State of Minnesota.

*Robert J. Kleinman, Jr.*  
ROBERT J. KLEINMAN, Jr.

ELIZABETH ANN GEORGE  
NOTARY PUBLIC-MINNESOTA  
HENNEPIN COUNTY  
My Commission Expires July 27, 1997



C.A.P.L.  
91  
SASK.

PETROLEUM AND NATURAL GAS LEASE  
93081 - 1B

C-24785



**This Indenture** made on the 24th day of November, 1993  
BETWEEN ROBERT J. KLEINMAN, Jr., of Minneapolis, in the state of Minnesota, one of the  
United States of America, as Executor of the Last Will and Testament of  
Robert J. Kleinman, Deceased.

(herein called the "Lessor")

HOME OIL COMPANY LIMITED, a body corporate, having an office at the city of Calgary, in the  
Province of Alberta.

(herein called the "Lessee")

THE LESSOR, being registered as owner, or entitled to become registered as owner of the leased substances (as hereinafter defined) within, upon or under that certain parcel or tract of land legally described as follows:

All mines and minerals within, upon or under the North East (NE) Quarter of Section Twenty-five (25) in Township Two (2), Range Thirty (30), West of the Principal Meridian (WPM).

as more particularly described and set forth in Certificate(s) of Title No. 62R24840 (herein called the "said lands") in consideration of the sum of \$10.00 paid to the Lessor by the Lessee, the receipt of which is hereby acknowledged by the Lessor, and of an additional consideration of Four Thousand Eight Hundred -- Canadian Funds -- Dollars

(\$ 4,800.00--) to be paid within 90 days of the date hereof and in consideration of the covenants of the Lessee hereinafter contained, HEREBY GRANTS AND LEASES exclusively unto the Lessee all the leased substances (as hereinafter defined) subject to the royalties hereinafter reserved, within, upon or under the said lands, together with all of the present or future right, title, estate and interest, if any, of the Lessor in and to the leased substances or any of them within, upon or under any lands excepted from the said lands and any roadways, lanes or rights of way adjoining the said lands; together with the exclusive right and privilege to explore for, drill for, operate for, produce, win, take, remove, store, treat and dispose of the leased substances and the right to inject substances into the said lands for the purpose of obtaining, maintaining or increasing production from the said lands, the pooled lands or the unitized lands and to store and recover any such substances injected into the said lands.

TO HAVE AND ENJOY the same for the term of Five ( 5 ) years (herein called the "primary term") commencing on the date hereof and continuing so long thereafter as operations (as hereinafter defined) are conducted upon the said lands, the pooled lands or the unitized lands, with no cessation, in the case of each cessation of operations, of more than 90 consecutive days.

THE LESSOR AND THE LESSEE HEREBY COVENANT AND AGREE AS FOLLOWS:

1. INTERPRETATION

In this Lease the following expressions shall have the following meanings:

- (a) "anniversary date" means the date corresponding to the date first above written in each year during which this Lease remains in force;
- (b) "commercial production" means the output from a well of such quantity of the leased substances or any of them as, considering the cost of drilling and production operations and price and quality of the leased substances, after a production test of suitable duration and nature in accordance with good oil field practice, would commercially and economically warrant the drilling of a like well in the vicinity thereof;
- (c) "force majeure" means any cause beyond the Lessee's reasonable control and, without limitation, includes an act of God, strike, lockout, or other industrial disturbance, act of any public enemy, war, blockade, riot, lightning, fire, storm, flood, explosion, unusually severe weather conditions, government restraints, including road bans, but shall not include lack of finances;
- (d) "lease year" means a period of one year commencing on the date first above written or any anniversary date and ending at midnight of the day immediately preceding the next anniversary date;
- (e) "leased substances" means all petroleum, natural gas and related hydrocarbons (except coal), and all materials and substances (except valuable stone), whether liquid, solid or gaseous and whether hydrocarbons or not, produced in association with petroleum, natural gas or related hydrocarbons or found in any water contained in any reservoir;
- (f) "offset well" means any well drilled on any spacing unit laterally adjoining the said lands, which spacing unit does not include lands owned by the Lessor or, if owned by the Lessor, not under lease to the Lessee;
- (g) "operations" means any of the following:
- (i) drilling, testing, completing, reworking, recompleting, deepening, plugging back or repairing a well or equipment on or in the said lands or injecting substances by means of a well, in search for or in an endeavor to obtain, maintain or increase production of any leased substance from the said lands, the pooled lands or the unitized lands;
- (ii) the production of any leased substance;
- (iii) the recovery of any injected substance; or
- (iv) any acts for or incidental to any of the foregoing;
- (h) "pooled lands" means all or any portion of the said lands and such other lands as may have been pooled, which pooling shall not exceed a spacing unit, in accordance with the terms hereof or pursuant to any agreement, or any statute, regulation, order or directive of any government or any governmental agency;
- (i) "rental" shall have the meaning given in paragraph 2;
- (j) "said lands" means all the lands and all zones and formations underlying the lands described above as the "said lands", or such portion or portions thereof as shall not have been surrendered;
- (k) "spacing unit" means the area allocated to a well from time to time on or in the vicinity of the said lands, for the purpose of drilling for or producing, as the case may be, the leased substances or any of them, as defined or prescribed by or under any statute, regulation, order or directive of any government or any governmental agency;
- (l) "suspended well payment" shall have the meaning given in paragraph 3;
- (m) "unitized lands" means all or any portion of the said lands and such other lands as may have been unitized in accordance with the terms hereof or pursuant to any agreement, statute, or any regulation, order or directive of any government or any governmental agency;
- (n) "Unit Agreement" means any agreement for the development or operation of all or any portion of the said lands together with other lands as a single unit without regard to separate ownership and for the allocation of costs and benefits on a basis as defined in the agreement.

RENTALS (Strike out inapplicable clause.)

Lump Sum

The Lessee shall, on or before the date on which the additional consideration provided for above is payable, pay to the Lessor a sum (herein called the "rental") equal to the sum of \_\_\_\_\_ Dollars (\$ \_\_\_\_\_).

Periodic Payments

If operations are not commenced on the said lands, the pooled lands or the unitized lands during the first lease year, the Lessee shall, on or before the expiration of the first lease year, pay or tender to the Lessor a sum (herein called the "rental") of one hundred sixty-- Dollars (\$ 160.00--) as the annual rental for the next ensuing lease year of the primary term.

If operations are not commenced on the said lands, the pooled lands or the unitized lands during any successive lease year during the primary term, the Lessee shall make like payments or tenders on or before the expiration of that year. For greater certainty, no rental shall be paid on the expiry of the primary term.

3. SUSPENDED WELLS

If, at the expiration of the primary term or at any time or times thereafter, there is any well on the said lands, the pooled lands, or the unitized lands, capable of producing the leased substances or any of them, and all such wells are shut-in or suspended, this Lease shall, nevertheless, continue in force as though operations were being conducted on the said lands, for so long as all the said wells are shut-in or suspended and so long thereafter as operations are conducted upon the said lands, the pooled lands or the unitized lands, with no cessation, in the case of each cessation of operations, of more than 90 consecutive days. If no royalties are otherwise payable hereunder during a lease year after the primary term within which such shut-in period or periods occur and during such lease year no other operations are conducted on the said lands, the pooled lands, or the unitized lands then the Lessee shall pay to the Lessor an amount equal to one hundred sixty (\$160.00)--

Dollars (\$ \_\_\_\_\_) within 90 days after the expiry of such lease year (herein called the "suspended well payment").

P.02/09

912049450586 TO 912049450586

NOU 28.97 11:45 FR RXL EXPL 24NM



#### 4. ROYALTIES

(a) The Lessee shall pay the Lessor a royalty in an amount equal to the current market value at the wellhead as and when produced of Fifteen percent (15%) of all the leased substances produced, saved and sold, or used by the Lessee for a purpose other than that described in subclause (b) hereof, from the said lands; provided that in computing the current market value at the wellhead of all the leased substances produced, saved and sold, or used by the Lessee for a purpose other than that described in subclause (b) hereof, the Lessee may deduct any reasonable expense incurred by the Lessee (including a reasonable rate of return on investment) for separating, treating, processing, compressing and transporting the leased substances to the point of sale beyond the wellhead or, if the leased substances are not sold by the Lessee in an arm's length transaction, to the first point where the leased substances are used by the Lessee for a purpose other than that described in subclause (b) hereof; provided further, however, that the royalty payable to the Lessor hereunder shall not be less than Sixty percent (60%) of the royalty that would have been payable to the Lessor if no such expenses had been incurred by the Lessee. In no event shall the current market value be deemed to be in excess of the value actually received by the Lessee pursuant to a bona fide, arm's length sale or transaction. The royalty as determined under this clause shall be payable on or before the 15th day of the second month following the month in which the leased substances, with respect to which the royalty is payable, were produced, saved and sold, or used by the Lessee for a purpose other than that described in subclause (b). No royalty shall be payable to the Lessor with respect to any substance injected into and recovered from the said lands, other than leased substances originally produced from the said lands for which a royalty has not been paid or payable.

(b) Notwithstanding anything to the contrary herein contained or implied, the Lessee shall be entitled to use such part of the production of leased substances from the said lands as reasonably may be required and used by the Lessee in its operations hereunder on the said lands, the pooled lands or the unitized lands and the Lessor shall not be entitled to any royalty with respect to leased substances so used.

(c) The Lessor agrees that the royalty reserved and payable hereunder in respect of the leased substances shall be inclusive of any prior disposition of any royalty or other interest in the leased substances, and agrees to make all payments required by any such disposition out of the royalty received hereunder and to indemnify and save the Lessee harmless from its failure to do so; provided, however, that the Lessee may elect by notice in writing to the Lessor to make such payments on behalf of the Lessor and shall have the right to deduct any such payments made from the royalty, rental and suspended well payments otherwise payable to the Lessor.

(d) The Lessee shall make available to the Lessor during normal business hours at the Lessee's address for notice, the Lessee's records relating to the leased substances produced from or allocated to the said lands.

#### 5. LESSOR INTEREST

If the Lessor's interest in the leased substances is less than the entire and undivided fee simple estate, the royalties, rentals and suspended well payments herein provided shall be paid to the Lessor only in the proportion which such interest bears to the entire and undivided fee.

#### 6. TAXES PAYABLE BY THE LESSOR

The Lessor shall promptly pay all taxes, rates and assessments that may be assessed or levied, directly or indirectly, against the Lessor by reason of the Lessor's interest in production of leased substances obtained from the said lands, or the Lessor's ownership of the leased substances.

#### 7. TAXES PAYABLE BY THE LESSEE

The Lessee shall pay all taxes, rates and assessments that may be assessed or levied in respect of the operations of the Lessee on, in, over or under the said lands, and shall further pay all taxes, rates and assessments that may be assessed or levied directly or indirectly against the Lessee by reason of the Lessee's interest in production of leased substances from the said lands. The Lessee shall on the written request of the Lessor, accompanied by such tax receipts, statements or tax notices as the Lessee may require, reimburse the Lessor for Eighty Five percent (85%) of any taxes assessed or imposed on the Lessor while this Lease remains in force by reason of the Lessor being the registered owner of the leased substances or being entitled to become such owner; provided that the Lessee shall, at the written request of the Lessor, pay the Lessor's said percentage of said tax and be reimbursed from any sums payable to the Lessor under this Lease.

#### 8. OFFSET WELLS

If commercial production is obtained after the date of this Lease from an offset well, then unless (i) a well has been or is being drilled on the spacing unit of the said lands laterally adjoining the spacing unit of the offset well and into the zone or formation from which commercial production is being obtained from the offset well, or (ii) all or part of the spacing unit of the said lands laterally adjoining the spacing unit of the offset well has been pooled or included in a unit in which the pooled or unitized substances include production from the same zone or formation from which production is being obtained from the offset well, the Lessee shall within 6 months from the later of the date of the offset well being placed on commercial production or, if information with respect to the amount of production from the offset well is restricted pursuant to any statute, regulation, order or directive of any government or governmental agency and such information is unknown to the Lessee, until one month after such information is made public, or within 6 months from notice thereof being given to the Lessee, in writing, by the Lessor,

(a) commence or cause to be commenced operations for the drilling of a well on the spacing unit of that portion of the said lands which comprises or is included in the spacing unit laterally adjoining the spacing unit of the offset well and thereafter drill, or cause to be drilled the same to the zone or formation from which production is being obtained from the offset well;

(b) pool or unitize that portion of the said lands which comprises or is included in the spacing unit laterally adjoining the spacing unit of the offset well, such as to include unitization to include production from the same zone or formation from which the offset well is being produced;

(c) surrender all or any portion of the said lands pursuant to the provisions hereof, provided that the surrender shall include but may be limited to the zone or formation from which production is being obtained from the offset well underlying that portion of the said lands which comprises or is included in the spacing unit laterally adjoining the spacing unit of the offset well; or

(d) pay to the Lessor at such times as royalty would be payable pursuant to the provisions of this Lease, until the provisions of paragraphs (a), (b) or (c) of this clause are met, a royalty which shall be proportionately equivalent on an acreage basis to such royalty as would have been payable to the Lessor if the leased substances produced from the offset well were actually being produced from a well on the said lands which commenced production on the last day of the said 6-month period; provided however, that should any spacing unit of the said lands laterally adjoin more than one spacing unit upon which is located an offset well from which commercial production is being obtained, the royalty which the Lessee may elect to pay to the Lessor pursuant to this subclause shall be calculated on the average of the production from the said offset wells, such average to be calculated by dividing the total production from all of the said offset wells by the number of all of the said offset wells.

Notwithstanding anything herein contained, the obligations imposed by this clause shall be deemed not to have arisen if (a) the offset well shall cease to be capable of or ceases commercial production during the said 6-month period, or (b) the offset well is productive primarily or only of natural gas and the Lessee has not previously arranged an adequate and commercial market for the natural gas which might be produced from any well to be drilled pursuant to this clause.

#### 9. POOLING AND UNITIZATION

(a) The Lessee is hereby given the right and power at any time and from time to time during and after the primary term to pool the said lands, or any portion thereof, or any zone or formation underlying the said lands or any portion thereof, or any of the leased substances therein, with any other lands or any zone or formation underlying such other lands or any portion thereof, or any of the leased substances therein, but so that the other lands or any zone or formation thereof, together with the said lands or any zone or formation thereof, shall not exceed one spacing unit. The Lessee shall thereafter give written notice to the Lessor describing the extent to which the said lands are being pooled and describing the spacing unit with respect to which they are so pooled. In the event of pooling there shall be allocated to that portion of the said lands included in the spacing unit that proportion of the total production of the leased substances from the spacing unit, after deducting any leased substances used in operations on the pooled lands, which the surface area of that portion of the said lands placed in the spacing unit bears to the total surface area of the lands in the spacing unit. The production so allocated shall be considered for all purposes, including the payment of royalty, to be the entire production of the leased substances from the portion of the said lands included in the pooling in the same manner as though produced from the said lands under the terms of this Lease.

(b) The Lessee may terminate any pooling pursuant to subclause (a) of this clause and thereafter shall give written notice to the Lessor.

(c) If the spacing unit pooled under this clause is varied or terminated by any statute, regulation, order or directive of any government or governmental agency, or if the pooling is terminated or invalidated by reason of the termination or expiration of a lease covering any lands, other than the said lands, within the spacing unit, or any other cause beyond the Lessee's reasonable control, and this Lease would otherwise terminate as a result of such variation or termination of the spacing unit or such termination or invalidation of the pooling, this Lease shall nonetheless continue in force for a period of 90 days after the Lessee receives notice that the spacing unit has been varied or terminated or the pooling has been terminated or invalidated and the term of the Lease may be extended further pursuant to other provisions of this Lease, including without limitation the commencement of operations, within the said 90-day period.

(d) The Lessee is hereby given the right and power at any time and from time to time during and after the primary term to include the said lands or any portion thereof or any zone or formation underlying the said lands or any portion thereof, or any of the leased substances therein, in a Unit Agreement for the unitized development or operation thereof with any other lands, or any zone or formation underlying such other lands, or any of the leased substances therein, if such becomes necessary or desirable in the opinion of the Lessee. The Lessee shall thereafter give written notice to the Lessor stating that the said lands are being or have been unitized. The basis shall be in the sole discretion and determination of the Lessee, exercised bona fide, and when so determined shall be binding upon the Lessor.

(e) In the event of unitization, the production of leased substances which are unitized shall be allocated to that portion of the said lands included in the unit in accordance with the terms of the Unit Agreement. The production so allocated shall be considered for all purposes, including the payment of royalty, to be the entire production of the leased substances from the portion of the said lands included in the unit in the same manner as though produced from the said lands under the terms of this Lease. Upon notice from the Lessor, the Lessee shall provide the Lessor with a copy of the Unit Agreement within a reasonable time after the right and power granted hereunder has been exercised. The Lessee shall also have the right and power to withdraw the said lands, or any portion or portions of the said lands or the leased substances, from the Unit Agreement and shall give the Lessor written notice thereof.

(f) Any operations conducted on the pooled lands or the unitized lands, whether conducted before, after or during the exercise of the rights and powers granted under this clause, or the presence of a shut-in or suspended well on the pooled lands or the unitized lands, shall have the same effect in continuing this Lease in force and effect during the term hereby granted or any renewal or extension thereof as if such operations were upon the said lands, or as if said shut-in or suspended well were located on the said lands.

#### 10. CONDUCT OF OPERATIONS

The Lessee shall conduct all operations on the said lands in a diligent, careful and workmanlike manner and in compliance with the provisions of any statutes, regulations, orders or directives of any government or governmental agency applicable to such operations, and where such provisions conflict with the terms of this Lease, such provisions shall prevail.

#### 11. INDEMNIFICATION

The Lessee shall indemnify the Lessor against all actions, suits, claims and demands by any person or persons whomsoever in respect of any loss, injury or damage arising out of or connected with any operations carried out by the Lessee on the said lands, the pooled lands, or the unitized lands unless such loss, injury or damage caused by the act or omission of the Lessor, its agents, employees or contractors.

#### 12. DISCHARGE OF TAXES AND ENCUMBRANCES

The Lessee may at the Lessee's option pay or discharge the whole or any portion of any withholding or other tax, charge, mortgage, lien or encumbrance payable, incurred or created by the Lessor or the Lessor's predecessors or successors in title or interest which may now or hereafter exist on or against or in any way affect the said lands or the leased substances, in which event the Lessee shall be subrogated to the rights of the holder or holders thereof and, at the Lessee's option, may reimburse itself by applying the amount so paid by the Lessee against the consideration payable hereunder, the rentals, suspended well payments, royalties, or other sums accrued or accruing to the Lessor under the terms of this Lease, and any sums so applied shall, for all purposes of this Lease, be deemed to have been paid to and received by the Lessor in payment of the consideration payable hereunder, the rentals, suspended well payments, royalties, or other sums accrued or accruing to the Lessor under the terms of this Lease, as the case may be.

### 13. SURRENDER

(a) Notwithstanding anything herein contained, the Lessee may, at any time or from time to time, by written notice to the Lessor, surrender this Lease as to the whole or any part of the leased substances or the said lands or both of them, and this Lease shall thereupon terminate as to the whole or any part of the leased substances or of the said lands or both of them so surrendered.

(b) Upon the said termination, the Lessee shall be released from all obligations accrued or to accrue respecting the said lands or the leased substances or both of them so surrendered excepting accrued royalty, rentals, suspended well payments, taxes and assessments. Any rentals paid shall not be refunded.

(c) Upon the said termination, suspended well payments and the obligation to pay rental and royalties shall be extinguished or proportionately reduced as the case may be; provided that if the Lessee surrenders all or any part of the said lands by zone or formation the rental hereinbefore specified shall not abate.

### 14. REMOVAL OF EQUIPMENT

The Lessee shall have at all times during the currency of this Lease and for a period of 6 months after its termination, the right to remove from the said lands all or any of its machinery, equipment, structures, pipelines, casing and materials whether placed upon, within or under the said lands.

### 15. DEFAULT

(a) If, before or after the expiry of the primary term, the Lessor considers that the Lessee has not complied with any provision or obligation of this Lease, including but not limited to a failure to give notice or to pay in the manner specified any rental, suspended well payments, royalty or other sums for which specific provision is made in this Lease, the Lessor shall notify the Lessee in writing, describing in reasonable detail the alleged breach or breaches. The Lessee shall have 30 days after receipt of such notice to:

- remedy or commence to remedy the breach or breaches alleged by the Lessor, and thereafter diligently continue to remedy the same; or
- commence and diligently pursue proceedings for a judicial determination as to whether the alleged acts or omissions constitute a breach or breaches on the part of the Lessee.

(b) The performance of any act by the Lessee intended to remedy all or any of the alleged breaches shall not be deemed an admission by the Lessee that it has failed to perform its obligations hereunder. If the Lessee fails to remedy or commence to remedy a breach or breaches within the 30-day period, or if having so commenced to remedy a breach or breaches thereafter fails to continue diligently to remedy the same, and if proceedings have not been commenced for a judicial determination as to whether the Lessee has failed to perform its obligations hereunder, this Lease, except for the Lessee's right with respect to the removal of equipment and its obligation to remove any registered document in relation to this Lease, shall thereupon terminate and it shall be lawful for the Lessor to re-enter the said lands and to repossess them. If proceedings for a judicial determination are commenced within the aforesaid period of time, this Lease shall not terminate until the existence of such breach has been finally judicially determined; nor shall it terminate if the Lessee within 30 days of such final determination has remedied or commenced to remedy the breach or breaches, and having so commenced to remedy the breach or breaches, thereafter diligently continues to remedy the same.

(c) Notwithstanding anything contained in this Lease, this Lease shall not terminate nor be subject to forfeiture or cancellation if there is located on the said lands or on the pooled lands or on the unitized lands a well capable of producing leased substances or any of them, or on which operations are being conducted; and, in that event, the Lessor's remedy for any default under this Lease shall be for damages only.

### 16. FORCE MAJEURE

(a) If operations are interrupted or suspended or cannot be commenced as a result of force majeure, this Lease shall not terminate during any such period of interruption, suspension or inability to commence caused thereby or for 30 days thereafter.

(b) If the Lessee is unable, in whole or in part, by force majeure to carry out its obligations hereunder, other than any obligation to make payment of any monies due hereunder, then the obligations of the Lessee, so far as they are affected by such force majeure, shall be suspended during the continuance of any inability so caused; and the cause of the force majeure so far as possible shall be remedied with all reasonable dispatch.

(c) Nothing herein shall require the settlement of strikes, lockouts or other labour disturbances except in the sole discretion of the Lessee.

### 17. QUIET ENJOYMENT

The Lessor covenants and warrants that, subject only to such mortgages and encumbrances contained in the existing Certificate of Title, the Lessor has not disposed of the Lessor's interest in all or any part of the said lands and the leased substances, and has the right and full power to enter into this Lease and to grant and demise the said lands and the leased substances, and that the Lessee, upon observing and performing the covenants and conditions on the Lessee's part to be observed and performed, shall and may peaceably possess and enjoy the same during the primary term of this Lease and any extensions thereof without any interruption or disturbance from or by the Lessor or any person claiming under or through the Lessor.

### 18. FURTHER ASSURANCES

The Lessor and the Lessee shall each do and perform all such further acts and execute and deliver all such deeds, documents and writings and give all such further assurances as may be reasonably required in order to fully perform and carry out the terms of this Lease.

### 19. MANNER OF PAYMENT

(a) All payments to the Lessor provided for in this Lease shall, at the Lessee's option, be paid or tendered either to the Lessor or to the depository named in or pursuant to this clause, and all such payments or tenders may be made by cheque or draft of the Lessee either mailed or delivered to the Lessor or to said depository, which cheque or draft shall be payable in Canadian funds. If payment is made by the Lessee to the depository, the Lessor does hereby appoint, Kleinman Realty Co., 1409 Willow Street, Suite 109, Minneapolis MN 55403

as the sole depository for the receipt of all monies payable under this Lease, and the Lessor agrees that said depository and its successors shall be and continue as its agent for the receipt of any and all sums payable hereunder, regardless of changes of ownership (whether by assignment, succession or otherwise and whether in whole or in part) of the said lands or the leased substances or of the consideration payable hereunder, rentals, suspended well payments or royalties to accrue hereunder. Any payment mailed to the Lessor or to the depository shall be deemed to have been paid 4 days (excluding Saturdays, Sundays and statutory holidays) after deposit in any mail box or post office.

(b) The Lessor may not cancel the appointment of a depository without designating a successor but may at any time designate a new depository by giving written notice to the Lessee specifying the name and address of such new depository; provided that

- only a bank, trust company, credit union, or treasury branch in Canada may be designated as a depository,
- only one depository shall be designated at any one time, regardless of whether or not any monies payable hereunder are, or become, payable to more than one person, and
- the Lessee shall not be required to recognize any new depository until the expiration of 45 days from the receipt by it of the notice in writing, but this shall not prohibit the Lessee from making payment to the new depository prior to the expiration of the 45-day period. All payments or tenders made to such new depository shall be deemed to have been made in accordance with the terms of this Lease.

(c) If any depository shall at any time resign, or fail or refuse to act as the depository hereunder and a new depository is not designated by the Lessor pursuant to the terms of this clause within 10 days from such resignation, failure or refusal to act, then the Lessee at its option may designate a depository hereunder, which depository shall be entitled to charge its usual fees and collect same from the Lessor, and said depository shall be the depository to all intents and purposes as if originally appointed by the Lessor.

(d) Should the Lessor be a non-resident of Canada, the Lessor acknowledges and agrees that the Lessee may deduct income, withholding or other taxes from any payment to the Lessor in compliance or intended compliance with the provisions of the Income Tax Act, tax agreements or treaties or other statutes of Canada or its Provinces as are from time to time enacted and amended, whereupon the timely remittance by the Lessee of the balance of the payment to the Lessor shall be deemed to constitute full performance by the Lessee in respect of such payment.

### 20. ASSIGNMENT

Each of the parties hereto may delegate, assign, sublet or convey to any other person, firm or corporation all or any of the property, powers, rights and interests obtained by or conferred upon them respectively by this Lease and may enter into all agreements, contracts and writings and do all necessary acts and things to give effect to the provision of this clause; provided that no assignment by the Lessor shall be binding upon the Lessee, notwithstanding any actual or constructive notice or knowledge thereof, unless and except when the same be for the entire interest of the Lessor. The Lessee need not act on any assignment until 45 days after the Lessee has been actually furnished with evidence satisfactory to it of such assignment. All payments made within the aforesaid period to the party or parties who would have been entitled to the same in the absence of such assignment shall be deemed to have been made in accordance with the terms of this Lease. The foregoing shall not, however, prohibit the Lessee from acting upon the assignment prior to the expiration of the aforesaid 45-day period and all payments or tenders made in accordance with such assignment shall be deemed to have been made in accordance with the terms of this Lease; provided further that if the Lessee shall assign this Lease as to any part or parts of the said lands, then the rental, suspended well payments and royalties shall be apportioned among the several lease holders ratably according to the surface area of each and should the assignee or assignees of any such part or parts fail to pay the proportionate part of the rental, suspended well payments and royalties payable by him or them, such failure to pay shall not affect this Lease insofar as it relates to and comprises the part or parts of the said lands in respect of which the Lessee or its assignees shall have made due payment.

### 21. NOTICES

- (a) All notices, communications and statements (herein called "notices") required or permitted hereunder shall be in writing. Notices may be served:
- personally by delivering them to the party on whom they are to be served at that party's address hereinafter given, provided such delivery shall be during normal business hours. Personally served notices shall be deemed received by the addressee when actually delivered as aforesaid; or
  - by telegraph or telecommunication (or by any other like method by which a written and recorded message may be sent) directed to the party on whom they are to be served at that party's address hereinafter given. Notices so served shall be deemed received by the respective addressees thereof (1) when actually received by them if received within the normal working hours of a business day, or (2) at the commencement of the next ensuing business day following transmission thereof, whichever is the earlier; or
  - by mailing them first class (air mail if to or from a location outside of Canada) post, postage prepaid, to the party on whom they are to be served. Notices so served shall be deemed to be received by the addressee at noon, local time, on the earlier of the actual date of receipt or the 4th day (excluding Saturdays, Sundays or statutory holidays) following the mailing thereof. No notice shall be effective if mailed during any period in which postal workers are on strike or if a strike of postal workers is imminent and may be anticipated to affect normal delivery of the notice.
- (b) The address for service of notices shall be as follows:

Lessee: 1600, 324 - 8th Ave. S.W.  
Calgary, Alberta T2P 2Z5

Lessor: 1409 Willow Street, Suite 109  
Minneapolis, Minnesota, USA  
55403

- (c) Any party may change its address for service by notice to the other party served as aforesaid.
- (d) Nothing herein shall in any way affect the method of the payment of monies as set out in clauses 19 and 20 of this Lease.



22. ENTIRE AGREEMENT

The terms of this Lease constitute the entire agreement between the parties, and no implied covenant or liability of any kind is created or shall arise by reason hereof or anything contained herein. This Lease supersedes and replaces all previous oral or written agreements, memoranda, correspondence or other communications between the parties relating to the subject matter hereof. The parties recognize that the terms of this Lease may be modified or affected by statute, regulation, order, or directive of any government or governmental agency.

23. NO AMENDMENT EXCEPT IN WRITING

No amendment or variation of the terms of this Lease shall be binding on any party unless it is evidenced in writing executed by the parties.

24. TIME OF THE ESSENCE

Time shall be of the essence.

25. ENUREMENT

This Lease shall enure to the benefit of and shall be binding upon the parties hereto and their respective heirs, executors, administrators, successors and assigns.

26. SEVERABILITY

If any provision hereof becomes illegal or unenforceable, the provision will be deemed to be severed and the Lease shall continue as amended.

IN WITNESS WHEREOF the Lessor and the Lessee have executed and delivered this Lease on the day and year first above written.  
SIGNED, SEALED AND DELIVERED  
by the Lessor in the presence of:

*Gail DeRoy*  
Gail DeRoy  
Witness  
Witness

ROBERT J. KLEINMAN, Jr., as Executor of  
the Last Will and Testament of  
Robert J. Kleinman, Deceased

Lessor

HOME OIL COMPANY LIMITED

Lessor

Per:  
BY ITS ATTORNEY - ROBERT S. KACHYNSKI

Per:  
BY ITS ATTORNEY - GORDON SCARTH MACLEOD

Lessee

AFFIDAVIT OF EXECUTION

I, Gail DeRoy of Minneapolis  
in the Province of Saskatchewan State of Minnesota, USA make oath and say:  
(Occupation)  
1. THAT I was personally present and did see ROBERT J. KLEINMAN, Jr.  
named in the within instrument, who is (deceased) personally known to me to be the person(s) named therein, duly sign, seal and execute the same for the purposes  
named therein.  
2. THAT the same was executed at Minneapolis, in the state of Minnesota, USA  
in the Province of Saskatchewan, and that I am the subscribing witness thereto.  
3. THAT I know the said ROBERT J. KLEINMAN, Jr.  
and he (deceased) is (deceased), in my belief, of the full age of eighteen years.  
SWORN before me at Minneapolis  
State of Minnesota, USA 7th  
in the Province of Saskatchewan, this  
day of December, A.D. 1993

*Elizabeth Ann George*

A Commissioner for Oaths and for the Province of Saskatchewan.  
My Appointment Expires

A Notary Public in and for  
the State of Minnesota.

ELIZABETH ANN GEORGE  
NOTARY PUBLIC-MINNESOTA  
HENNEPIN COUNTY  
My Commission Expires July 27, 1997

THE HOMESTEADS ACT AFFIDAVIT

I, Robert J. Kleinman, Jr. of Minneapolis, Saskatchewan, make oath and say that  
1. I am the Lessor named in the attached disposition.  
2. My spouse and I have not occupied the land described in this disposition as our homestead at any time during our marriage.  
3. I have no spouse.

FORM F

(subsection 19(4) of the Act)

AFFIDAVIT OF PERSONAL REPRESENTATIVE

I, Robert J. Kleinman, Jr., of Minneapolis, in the State of Minnesota,  
MAKE OATH AND SAY THAT:

1. I am the Executor of the Last Will and Testament of Robert J. Kleinman, deceased, and as such a signator to the above-attached disposition.
2. No part of the land described in this disposition was occupied by the said Robert J. Kleinman, deceased, and his or her spouse as their homestead at any time during their marriage.

SWORN before me at Minneapolis,  
in the State of Minnesota, USA  
this 7th day of December  
A.D. 1993.

*Elizabeth Ann George*  
A Notary Public in and for the  
State of Minnesota.

*Robert J. Kleinman, Jr.*  
ROBERT J. KLEINMAN, Jr.

ELIZABETH ANN GEORGE  
NOTARY PUBLIC-MINNESOTA  
HENNEPIN COUNTY  
My Commission Expires July 27, 1997



**Faxed**

November 5, 1997

Mr. Myron Sereda  
Saskatchewan Energy and Mines  
1914 Hamilton Street  
Regina SK S4P 4V4

**Re: Application for Off-Target Penalty Relief**

Anderson Exploration has applied to Manitoba Energy and Mines for waiver of the off-target penalty for a well to be drilled at 5-30-2-29 (WPM), adjacent to the Manitoba/Saskatchewan border. A copy of the application is attached for your reference.

The target area for standard 16 ha spacing in Manitoba is a square 100 m from and parallel to the LSD boundaries. Anderson's proposed well is located 25 m east of the target area toward the border (see Figure 1).

Anderson is the working interest owner in Section 25-2-30 (WPM) and the royalty owners, Kleinman and Odlaug, have consented to the off-target location. The Branch has asked Anderson to submit a copy of the subject leases for verification. In Manitoba, the Branch will automatically grant a waiver of the off-target penalty in two situations, where correlative rights concerns are satisfied:

- (1) where the well is off-target toward lands of common royalty and working interest ownership; and
- (2) as in this case, where the well is off-target towards lands of different royalty and/or working interest ownership and the offsetting owners consent to the waiver.

Anderson has asked for a quick turnaround on its application because they currently have a rig drilling in the area. Please provide me with any concerns you have with the application before November 13, 1997. If you have any questions don't hesitate to call me at (204) 945-6574.

Yours truly,

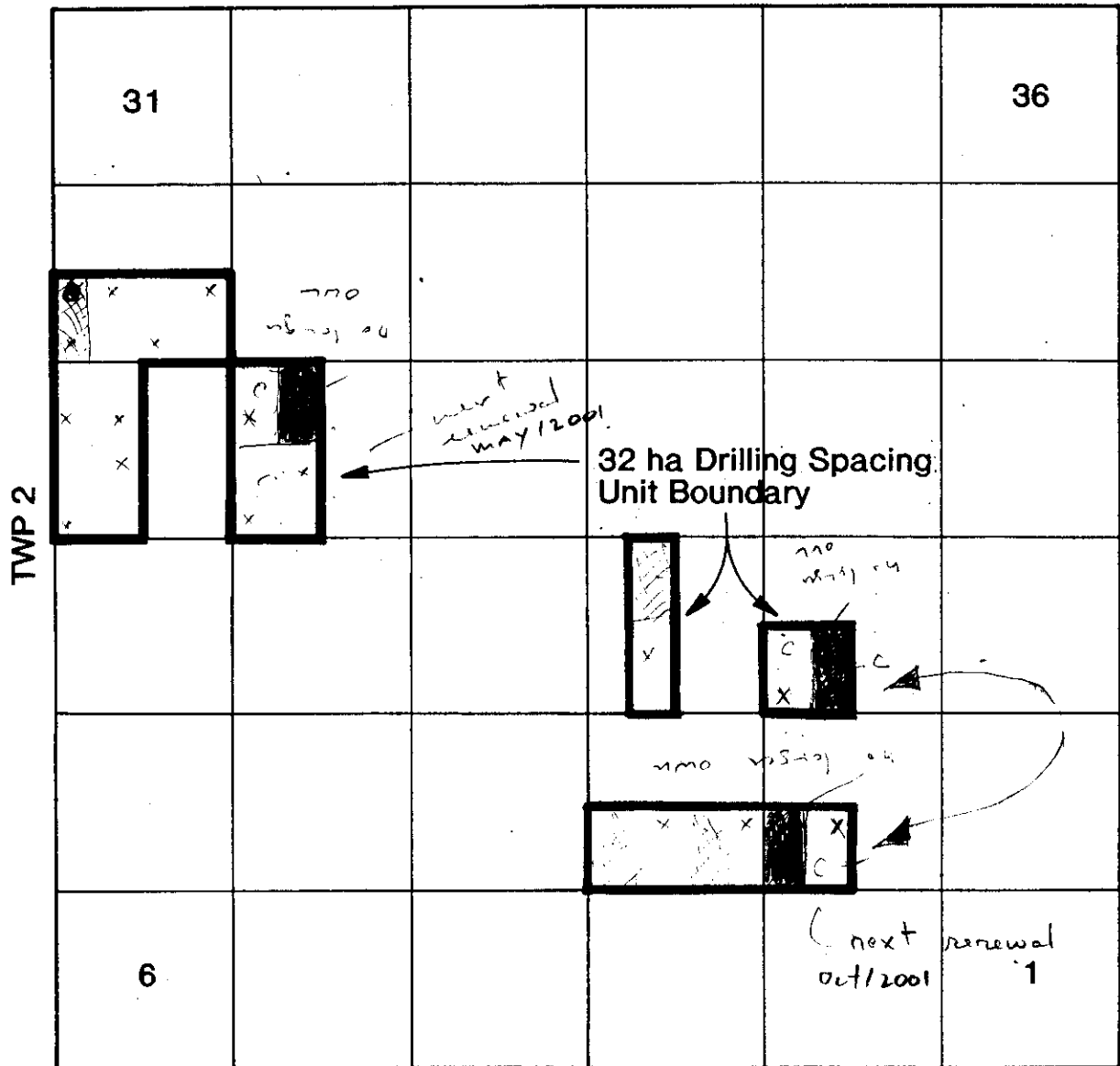


John N. Fox, P.Eng.  
Chief Petroleum Engineer

cc. Brent Arnell, Anderson Exploration

# BOARD ORDER NO. SU 9 SCHEDULE A - REVISED

## PIERSON AREA 32 ha DRILLING SPACING UNITS LOWER AMARANTH AND MISSION CANYON FORMATIONS



RGE 29 (WPM)

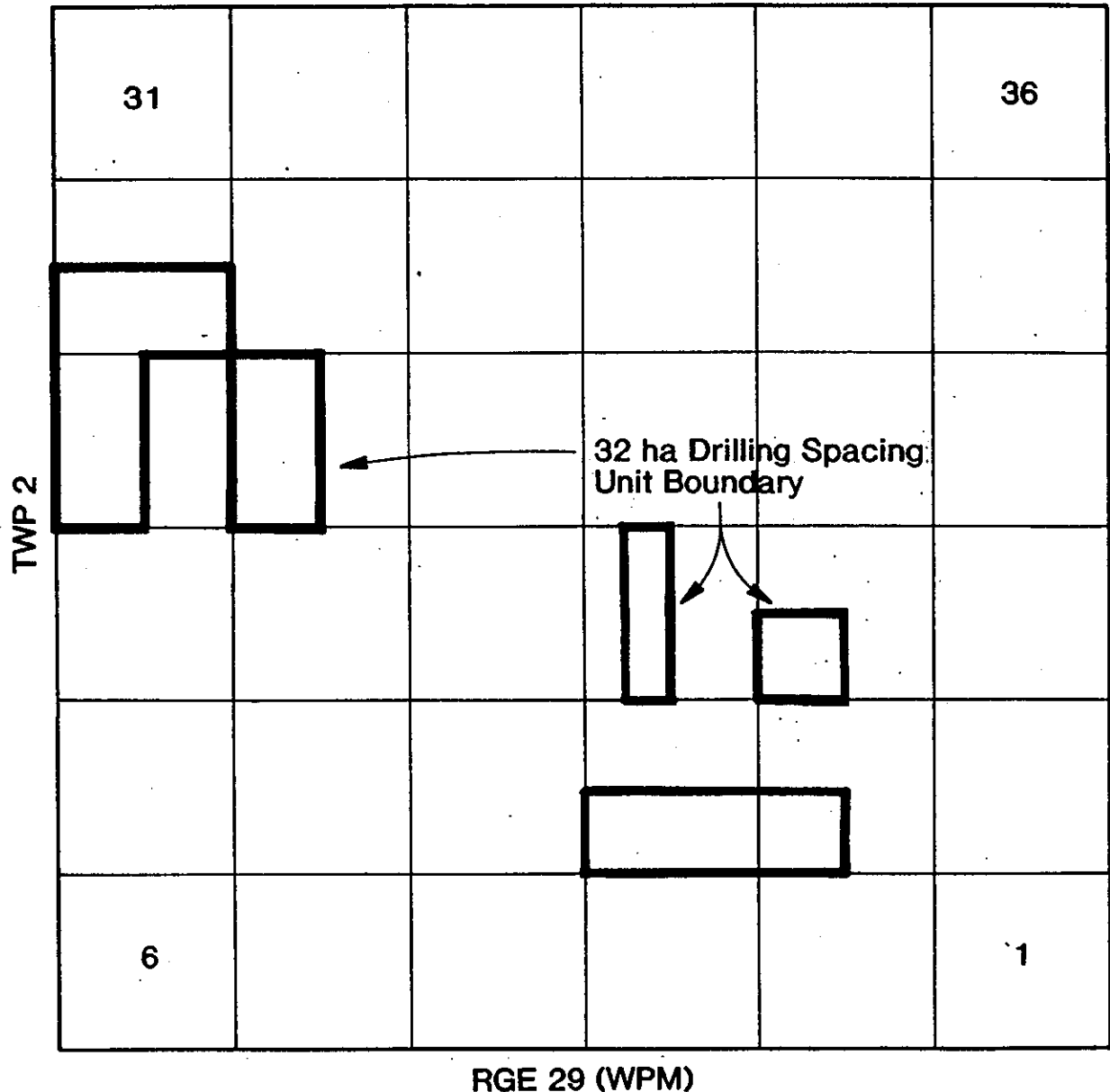
EFFECTIVE DATE: November 24, 1995

APPROVED: *[Signature]*  
Director of Petroleum for Minister Energy and Mines

DATE: Nov. 24, 1995

**BOARD ORDER NO. SU 9  
SCHEDULE A - REVISED**

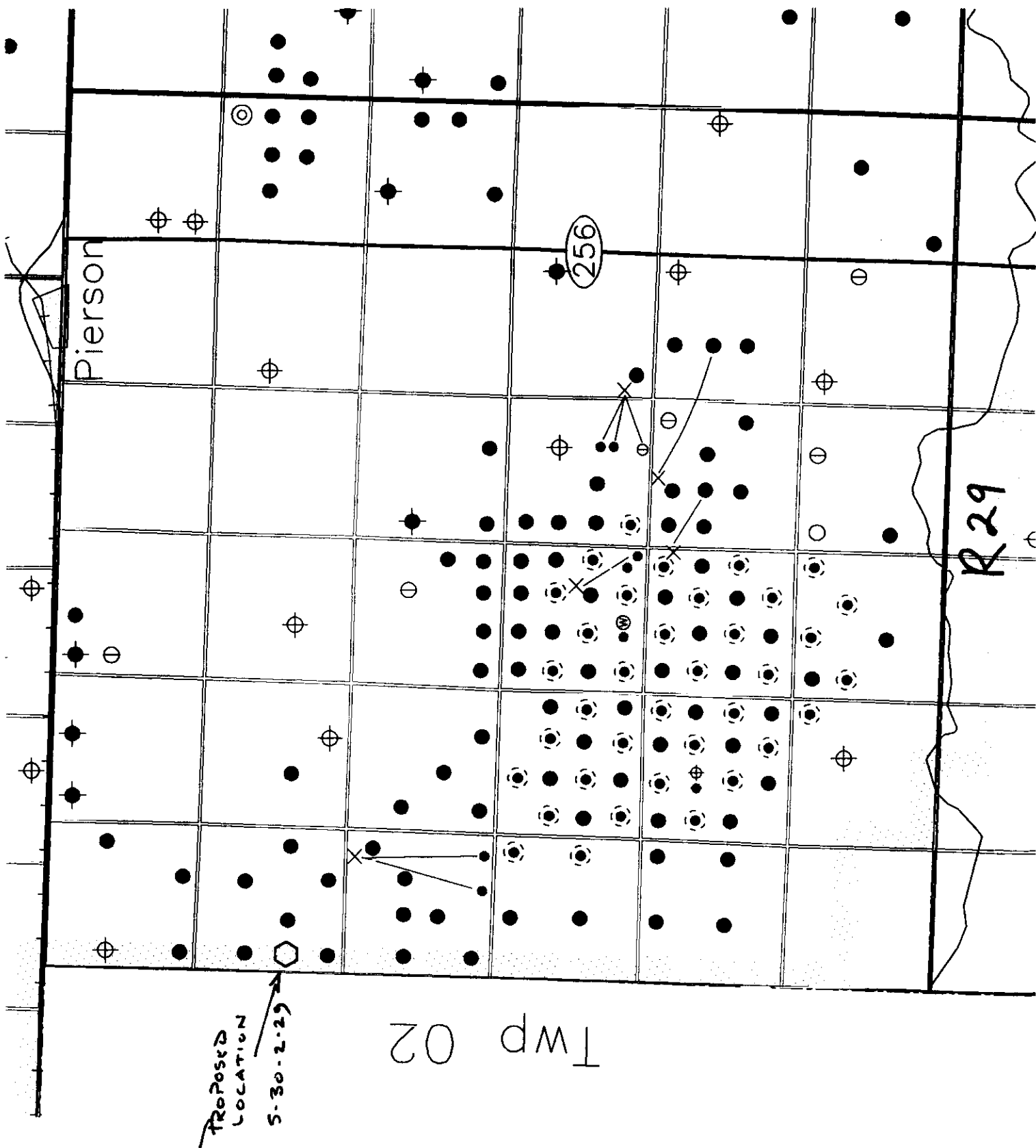
**PIERSON AREA  
32 ha DRILLING SPACING UNITS  
LOWER AMARANTH AND MISSION CANYON FORMATIONS**



EFFECTIVE DATE: November 24, 1995

APPROVED: *[Signature]*  
Director of Petroleum for Minister Energy and Mines

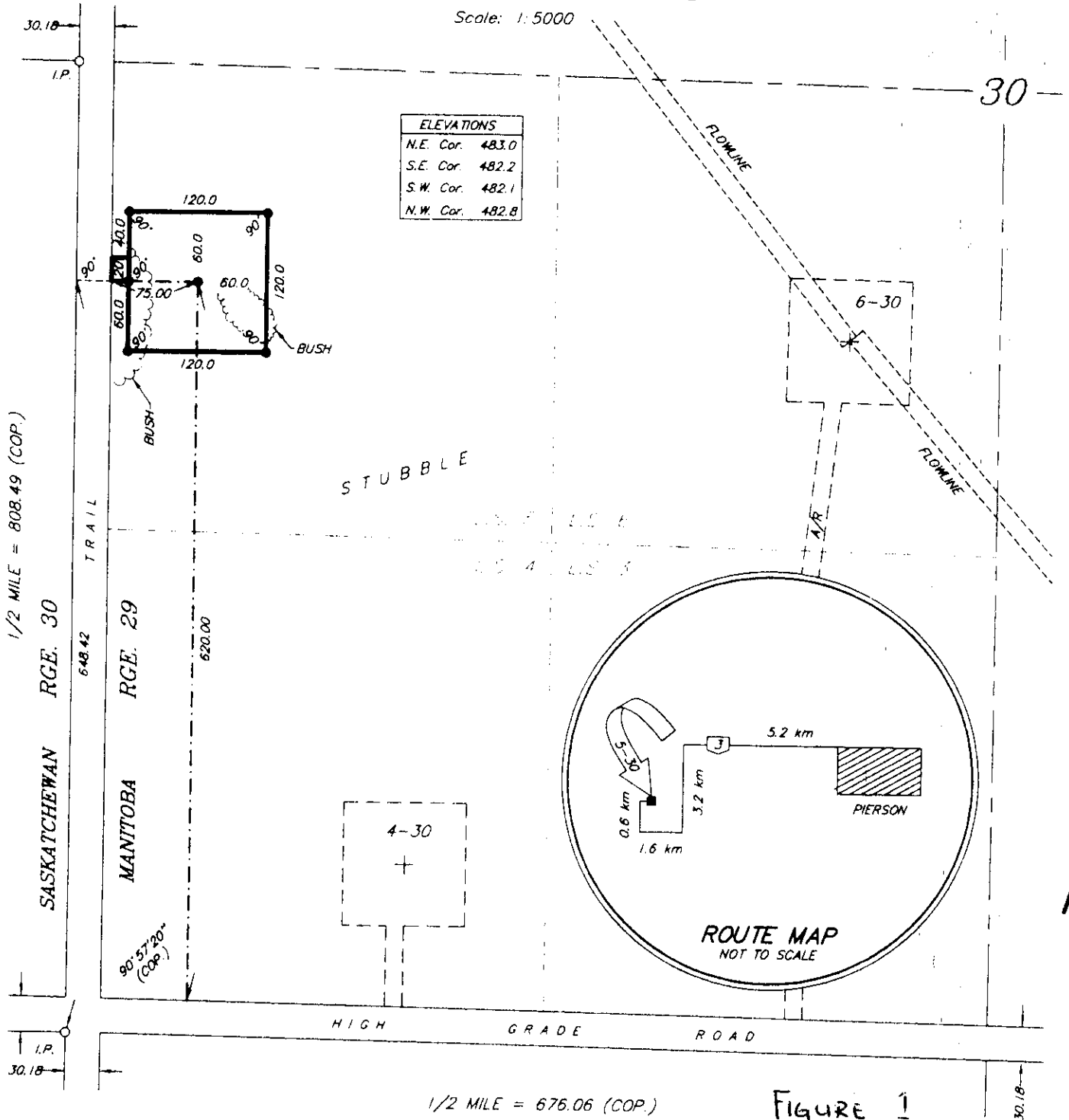
DATE: Nov. 24, 1995



# ANDERSON S. PIERSON 5-30-2-29

## Well Site and Access Road

L.S. 5, Sec. 30, Tp. 2, Rg. 29, W.1.M.



I certify that the survey represented by this plan is correct and true to the best of my knowledge and was completed on the 3rd day of October, A.D. 1997.

*David Quirk*  
Manitoba Land Surveyor

*Euna Holzer*  
Witness

David J. Quirk, MLS  
Manitoba Land Surveyor  
110 King Street  
Estevan, Saskatchewan  
S4A 2A7

Phone (306)634-2636  
Fax (306)634-3164

OPERATOR:

ANDERSON RESOURCES LTD.

ELEVATION: 482.75 Ground

CO-ORDINATES: 620.00 N. of S. Bdry.  
75.00 E. of W. Bdry. } Sec. 30

AREAS: Well Site: 1.44 ha ( 3.56 ac.)  
Access Road: 0.03 ha ( 0.07 ac.)  
Total: 1.47 ha ( 3.63 ac.)

### NOTE:

All underground installations should be located by the respective authorities prior to construction.  
There are no surface improvements within 75m of Well location except as shown.

Portion referred to shown thus ————   
Survey monuments found are shown thus ————   
Iron spikes 30cm planted are shown thus ————   
Iron posts 0.025 x 0.025 x 0.910 m. planted are shown thus ————

E-1946J

REVISIONS:

# ANDERSON EXPLORATION

1600, 324 Eighth Avenue S.W.  
Calgary, Alberta T2P 2Z5  
Phone: (403) 232-7100

97/10/29

Manitoba Energy and Mines  
Petroleum Branch  
555 - 330 Graham Avenue  
Winnipeg, Manitoba  
R3C 4E5

ATTENTION: Mr. L.R. Debreuil  
Director, Petroleum Branch

Dear Sir:

**Re: Application for Waiver of Off-Target Penalty  
Application for Special DSU  
Anderson South Pierson 5-30-002-29W1**

Anderson Exploration hereby applies for waiver of any off target ~~penalty~~<sup>east</sup> for a proposed oilwell at 5-30-002-29W1. The well will be located at 75 meters ~~west~~<sup>east</sup> and 620 meters north of the SW corner of section 30-002-29W1. The primary target for the well is a seismic anomaly in the Mission Canyon formation. The Lower Amaranth is a secondary target. Moving the well to inside the normal target area for a single lsd drilling spacing unit would increase the risk of an uneconomic well based on our interpretation of a 3D seismic survey.

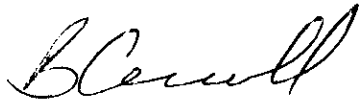
We also make application to reduce the approved drilling spacing unit from the current 32 hectares to 16 hectares for lsd 4 and 5-30-002-29W1. We believe that this spacing is appropriate for this small area because of the combination of Mission Canyon and Lower Amaranth reserve potential. This makes drilling under primary production economically viable.

In other areas with 32 hectare spacing, infill drilling is unattractive without potential waterflood recovery because the Lower Amaranth is the primary target. Waterflood response in the South Pierson Unit is unclear at this point in time. Recent optimization work including 12 well workovers and a new water source well, all completed in the last 18 months, may soon have a positive effect which would encourage expansion of the waterflood to these 32 hectare spacing units. At this point in time we are not able to justify this expansion and request that no other changes be made to existing spacing so that we are not faced with premature investment decisions relating to offset obligations in our lease agreements.

Please find attached letters of consent for drilling the 5-30 well from offsetting mineral owners in section 25-002-30W1. If more information is required please contact the Brent Arnell at (403) 232-5524.

Yours truly,

ANDERSON EXPLORATION

A handwritten signature in black ink, appearing to read "B. Arnell", written in a cursive style.

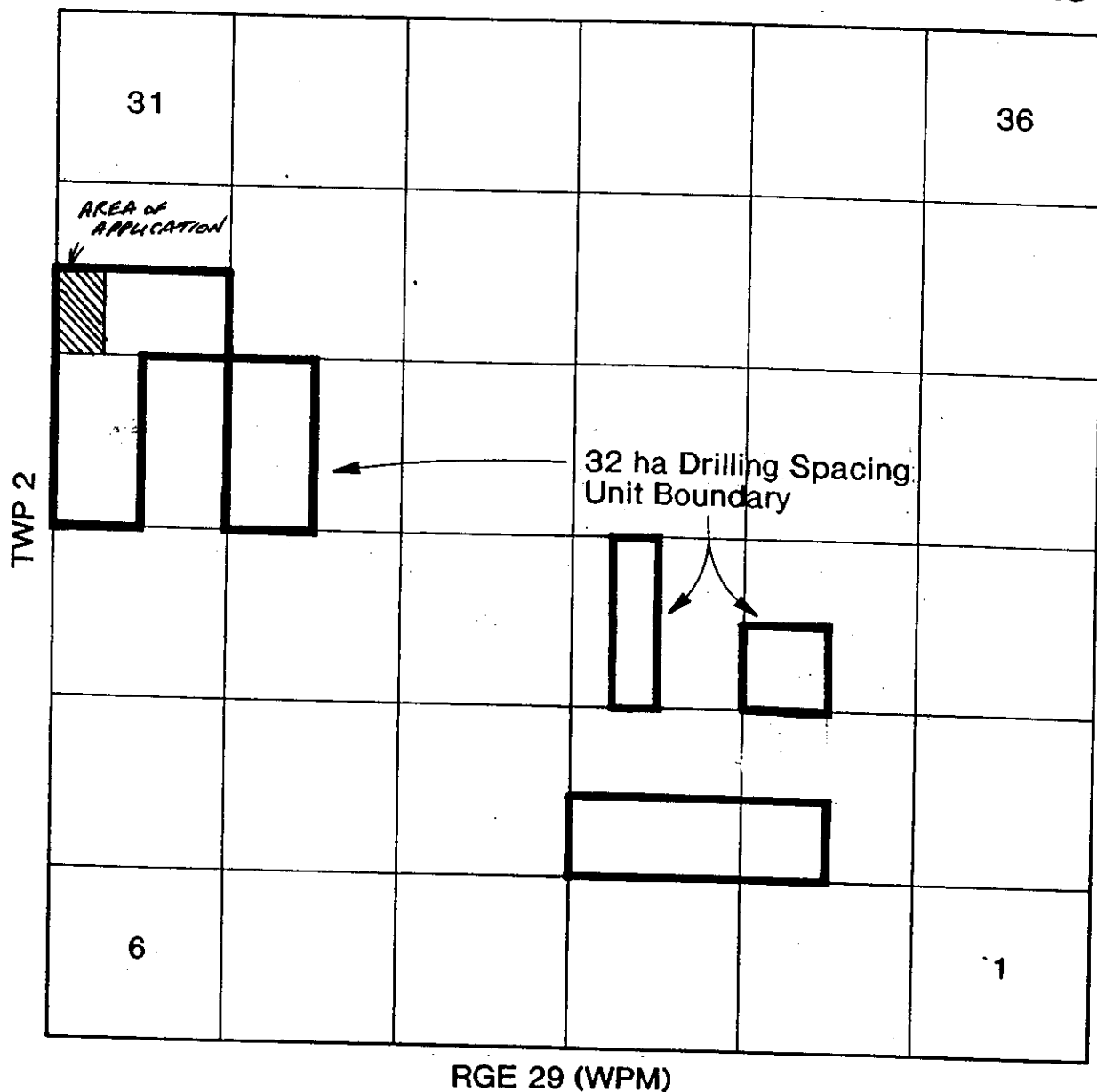
Brent Arnell  
Exploitation Department

Attachments



BOARD ORDER NO. SU 9  
SCHEDULE A - REVISED

PIERSON AREA  
32 ha DRILLING SPACING UNITS  
LOWER AMARANTH AND MISSION CANYON FORMATIONS



EFFECTIVE DATE: November 24, 1995


APPROVED: *[Signature]*  
Director of Petroleum for Minister Energy and Mines

DATE: Nov. 24, 1995

# ANDERSON EXPLORATION

1600, 324 Eighth Avenue S.W.  
Calgary, Alberta T2P 2Z5  
Phone: (403) 232-7100

September 29, 1997



Robert J. Kleinman Jr.  
Suite 109, 1409 Willow Street  
Minneapolis, Minnesota, U.S.A.  
55403

Bruce Garland Odlaug  
1324 Laura Street  
Mendota Heights, Minnesota, U.S.A.  
55118

Dear Sirs:

**RE: WAIVER OF OFF-TARGET LOCATION  
OUR FILES: M05808 and M05809**

Anderson Exploration is currently completing a drilling program in Twp. 2, Rge. 30, WPM. In the near future, we plan to move the drilling rig we have been using to a location at 5-30-2-29 WPM, which is off-target (as opposed to on-target).

An on-target location is a specific location in a section where a company is normally required to drill by government regulation. The purpose of the regulation is to provide for orderly development and conservation. However, our preferred location in 5-30 (which we feel is the best location to be successful) is off-target.

Normally Anderson would approach both Manitoba Energy & Mines and Saskatchewan Energy & Mines and request an off-target waiver. This process usually takes a minimum of thirty (30) days. The Saskatchewan and Manitoba governments then contact any mineral owners that have an interest in the adjacent lands. Anyone who has a vested interest can object; usually nobody does.

You should be aware that any unnecessary delay to our drilling program will obviously be more expensive and we run a real risk of losing the rig, which will jeopardize the remainder of our program. The only alternative, is to provide the Crown with written confirmation from each lessor that you do not object to an off-target location.

If our off-target location is successful, additional wells may be drilled in the area, which of course, could be beneficial for all concerned.

**ANDERSON**  
EXPLORATION

Robert J. Kleinman, Jr.  
Bruce Garland Odlaug  
September 29, 1997  
Page 2

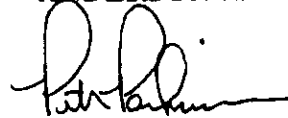
---

In order to keep our rig moving, we must obtain a drilling licence from the Crown by October 13, 1997 and provide them with written confirmation of your agreement to waive any off-target location.

If you are agreeable to any off-target waiver, would you please date and sign, in the space provided, and return to Anderson by mail and fax (if possible) at (403) 232-7429. Should you have any questions, please call me collect at (403) 232-5583.

Yours truly,

**ANDERSON EXPLORATION**



P. C. (Peter) Parkinson  
Landman

PCP:dn  
Encl.

cc: Brent Arnell

I / We agree and consent to any off-target waiver required by  
Anderson Exploration dated this 7<sup>TH</sup> day of October, 1997.



Robert J. Kleinman, Jr.

Bruce Garland Odlaug

j:\winword\pcp\letters\kleinma.001

**ANDERSON**  
EXPLORATION

Robert J. Kleinman, Jr.  
Bruce Garland Odlaug  
September 29, 1997  
Page 2

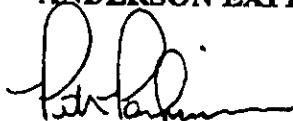
---

In order to keep our rig moving, we must obtain a drilling licence from the Crown by October 13, 1997 and provide them with written confirmation of your agreement to waive any off-target location.

If you are agreeable to any off-target waiver, would you please date and sign, in the space provided, and return to Anderson by mail and fax (if possible) at (403) 232-7429. Should you have any questions, please call me collect at (403) 232-5583.

Yours truly,

**ANDERSON EXPLORATION**



P. C. (Peter) Parkinson  
Landman

PCP:dn  
Encl.

cc: Brent Arnell

I / We agree and consent to any off-target waiver required by  
Anderson Exploration dated this 7<sup>th</sup> day of October, 1997.



Robert J. Kleinman, Jr.



Bruce Garland Odlaug

j:\winword\ppl\letters\ldc\anna.001



## Memorandum

Date November 23, 1995

To Bob Dubreuil  
Director  
Petroleum Branch

File:  
Field/Pool  
PIERSON  
LAmmant/LME 36 A  
Pool - 32 ha  
Spacing

Fox,  
Petroleum Engineer  
Petroleum Branch

Subject **Modification of Board Order No. SU 9**  
**32 ha Spacing - Pierson Area**

Home Oil, now Anderson Exploration was requested by the Branch to review the need for continuing 32 ha spacing in the Pierson area. In a letter dated September 22, 1995 the Branch suggested, based on Anderson's proposed depletion strategy (08/30/95), that Anderson's lands could be divided into three categories (Fig. 1):

- (1) lands uneconomic to develop,
- (2) lands developed by horizontal wells or with horizontal drilling potential, and
- (3) lands with waterflood potential.

The Branch also indicated it believed development of these lands would be more appropriate on 16 ha spacing.

Anderson indicated the waterflood is under review as no response has been observed to date. The company indicated that horizontal drilling results to date have been mixed and a decision to drill additional horizontal wells cannot be made until the current wells have a longer production history. The company also expressed concerns that offset drilling obligations could negatively impact their future development plans. Anderson agreed with the Branch that lands uneconomic to develop should be removed from the spacing order at this time.

Clause 3 of Board Order No. SU 9 provides for the spacing area to be modified from time to time to meet changing conditions. It is recommended that the spacing be modified as outlined in Figure 2 and Schedule A to exclude those lands deemed uneconomic to develop and lands within the drainage units of horizontal wells. Anderson had requested 16 ha for the 2-19 horizontal well and it is consistent and reasonable to reduce the spacing for their other horizontal wells. This results in a change in the drainage unit for the 11-11-2-29 well which is Crown (Lsd 14-11 is no longer in the drainage unit). The proposed letter of approval to Anderson is attached.

John N. Fox



November 23, 1995

Mr. J.C. Chan  
Exploitation Engineering  
Anderson Exploration Ltd.  
1600 Home Oil Tower  
324 - 8th Avenue SW  
Calgary AB T2P 2Z5

Dear Mr. Chan:

**RE: Modification of Board Order No. SU 9**

The Branch is in receipt of your letter dated October 25, 1995 regarding modification to the 32 ha spacing area approved under Board Order No. SU 9.

In accordance with Clause 3 of Board Order No. SU 9, Schedule A is modified as attached, to exclude those lands indicated by Anderson as being uneconomic to develop and lands within the drainage unit of existing horizontal wells. The continued appropriateness of this order will be reviewed by the Branch in October 1996.

Reduced 16 ha spacing has an impact on the drainage unit for the 11-11-2-29 well. The revised drainage unit for the 11-11 well includes only Lsd's; 9-10, 10-10, 15-10, 16-10, 11-11, 12-11 and 13-11.

If you have any questions in respect of this matter, please contact John N. Fox, Chief Petroleum Engineer at (204) 945-6574.

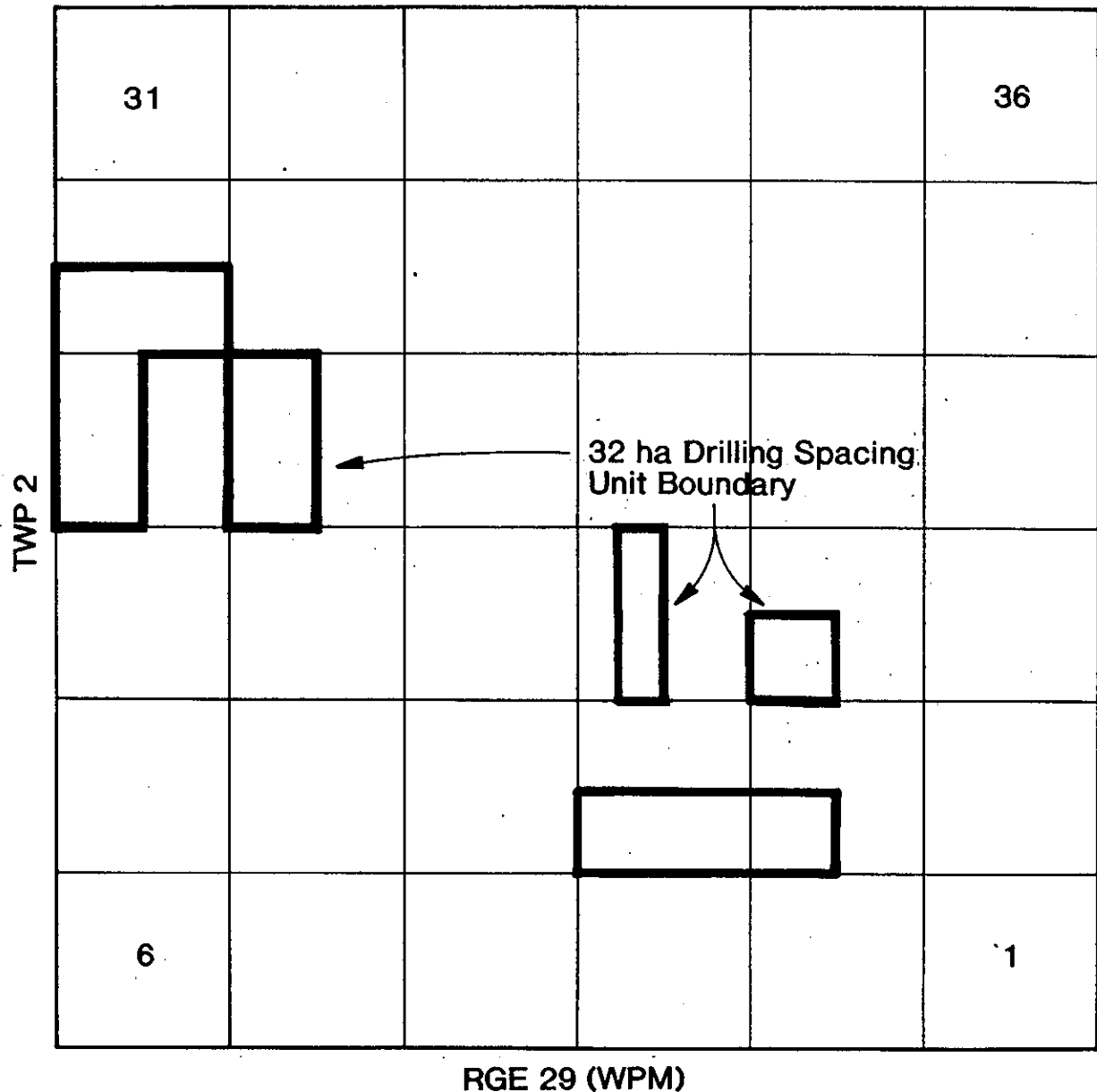
Yours truly,



L.R. Dubreuil  
Director of Petroleum

BOARD ORDER NO. SU 9  
SCHEDULE A - REVISED

PIERSON AREA  
32 ha DRILLING SPACING UNITS  
LOWER AMARANTH AND MISSION CANYON FORMATIONS



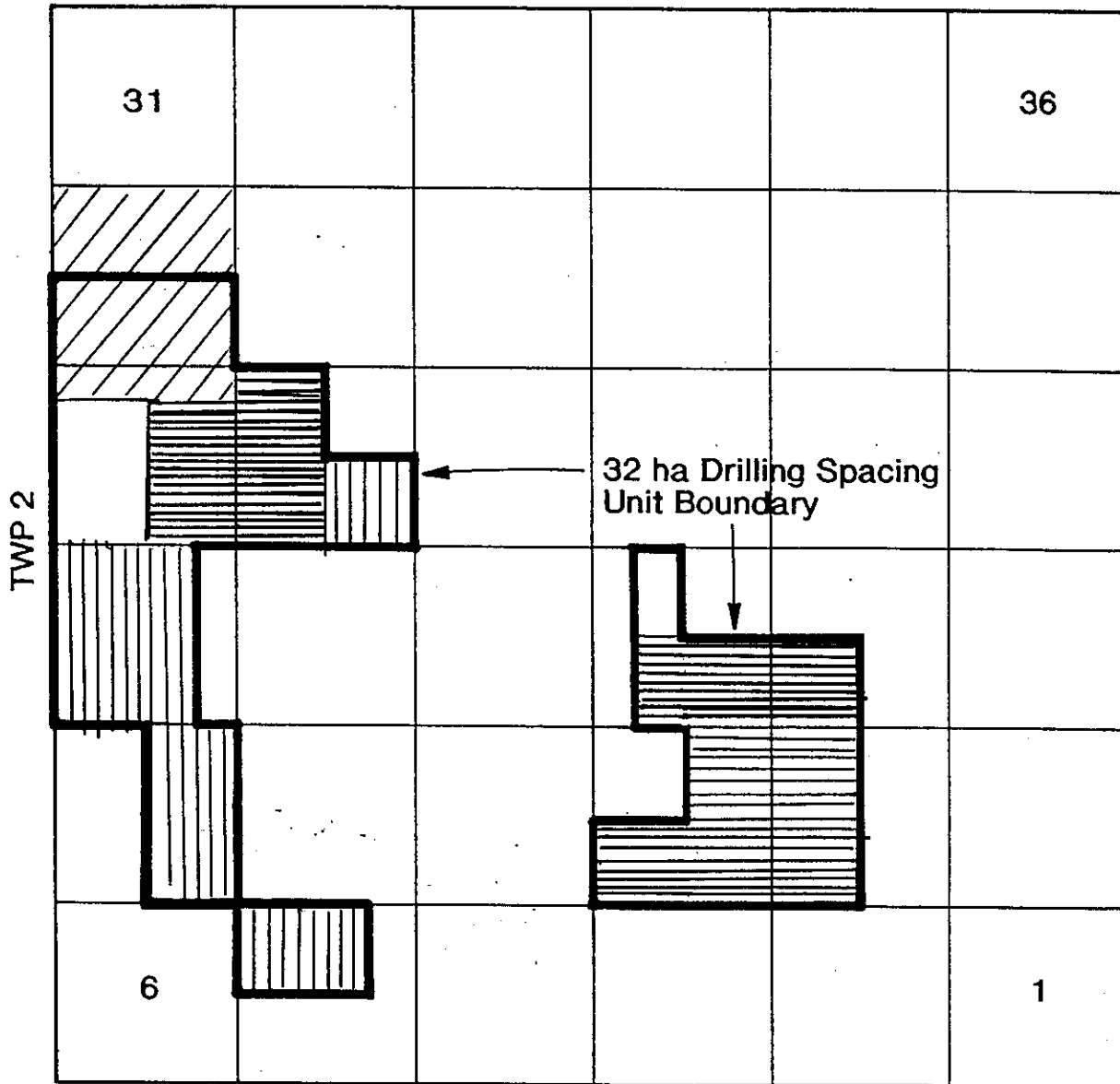
EFFECTIVE DATE: November 24, 1995

APPROVED: *[Signature]*  
Director of Petroleum for Minister Energy and Mines

DATE: Nov. 24, 1995

BOARD ORDER NO. SU 9  
SCHEDULE A - REVISED

PIERSON AREA  
32 ha DRILLING SPACING UNITS  
LOWER AMARANTH AND MISSION CANYON FORMATIONS



UNECONOMIC  
TO DEVELOP



WATERFLOOD  
POTENTIAL



DEVELOPED OR  
PROPOSED FOR DEVELOPMENT  
BY HORIZONTAL DRILLING

EFFECTIVE DATE: May 10, 1995

APPROVED: \_\_\_\_\_

Director of Petroleum for Minister Energy and Mines

DATE: \_\_\_\_\_

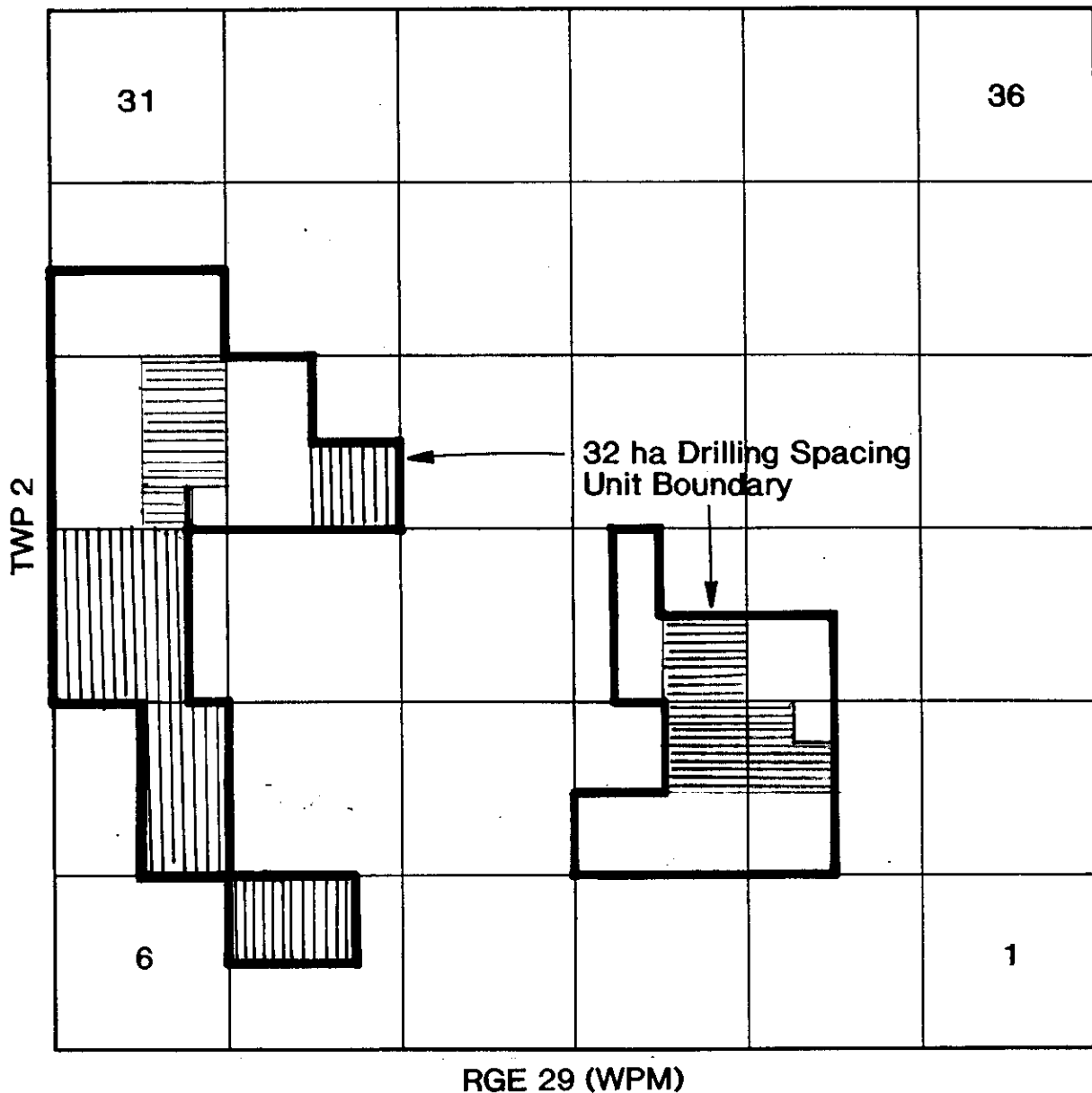
MAY 12, 1995

FIGURE 1



# BOARD ORDER NO. SU 9 SCHEDULE A - REVISED

## PIERSON AREA 32 ha DRILLING SPACING UNITS LOWER AMARANTH AND MISSION CANYON FORMATIONS



UNECONOMIC TO DEVELOP

HORIZONTAL WELL DRAINAGE UNITS

EFFECTIVE DATE: May 10, 1995

APPROVED: \_\_\_\_\_

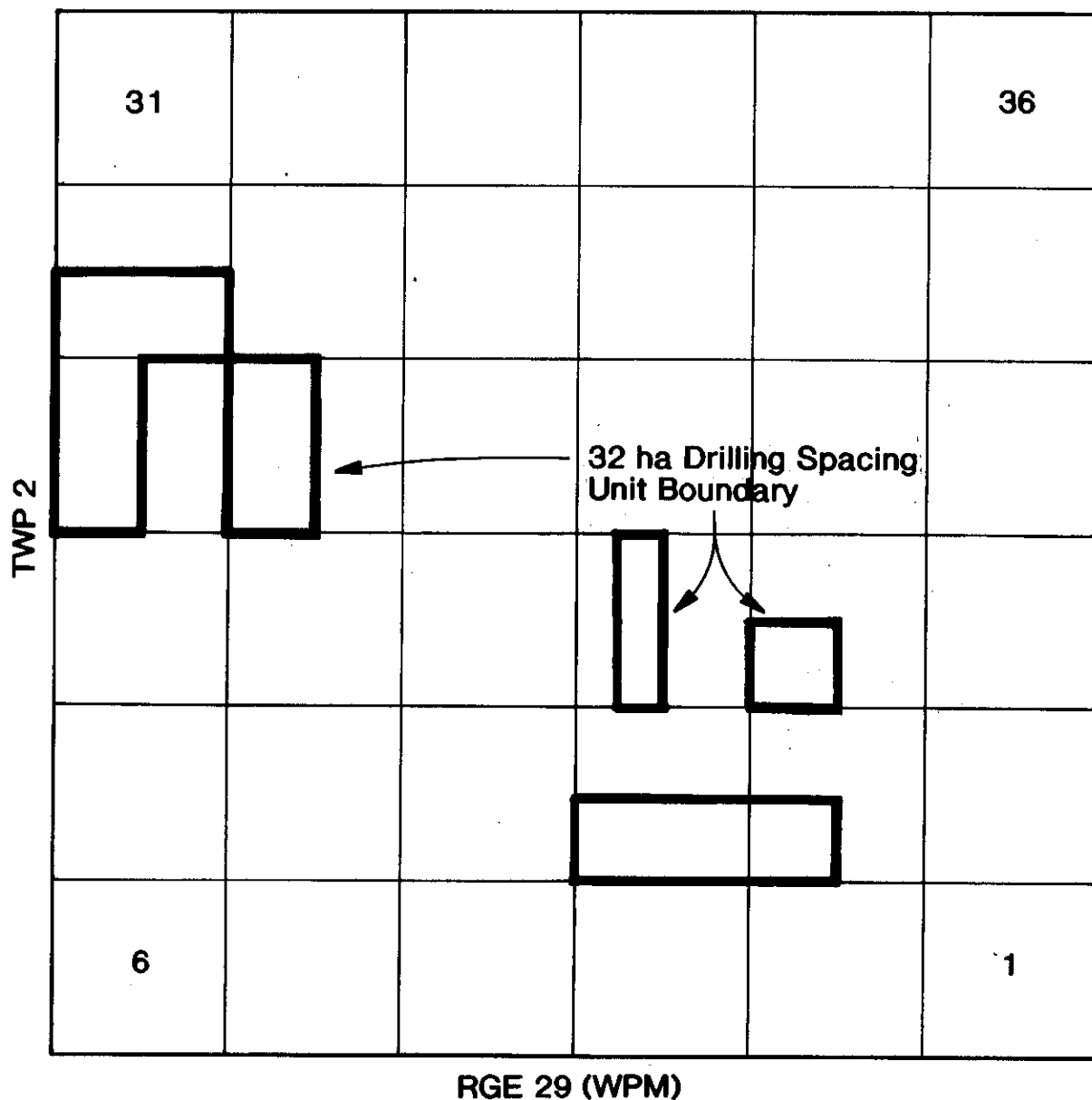
Director of Petroleum for Minister Energy and Mines

DATE: \_\_\_\_\_

MAY 12, 1995

# BOARD ORDER NO. SU 9 SCHEDULE A - REVISED

## PIERSON AREA 32 ha DRILLING SPACING UNITS LOWER AMARANTH AND MISSION CANYON FORMATIONS



EFFECTIVE DATE: \_\_\_\_\_

APPROVED: \_\_\_\_\_  
Director of Petroleum for Minister Energy and Mines

DATE: \_\_\_\_\_

JOHN -

① BECAUSE WE HAVE RECEIVED NO COMP INTS FROM MINERAL OWNERS OR ANYONE ELSE, IT IS PROBABLY NOT WARRANTED FOR US TO UNILATERALLY RESCIND THE ORDER.

② BASED ON HOME/ANDERSON'S TWO LETTERS, THE FOLLOWING LANDS SHOULD BE REMOVED FROM S.L. 9.

NW + LSD 10+15-5-2-29 ✓

E 7-2-29 ✓

W + LSD 2, 7, 10+15-18-2-29 ✓

E 1/2 19-2-29 ✓ (WITH OR WITHOUT LSD 15+16?)

SE-20-2-29 ✓

③ WHAT HAPPENS IN NE10 + NW11 (DRAINED BY A HORIZONTAL WELL)? ALSO SE15? SUGGEST THAT LANDS WHERE HORIZONTAL WELLS ARE DRILLED SHOULD ALL BE TREATED THE SAME (I.E. ALL 32 ha OR all 16 ha.)

④ CONFIRM LANDS TO BE RESCINDED AND PREPARE AMENDMENT TO THE ORDER.

⑤ WHAT CATEGORY DOES LSD 11+14-15-2-29 AND SW-19 AND LSD 11+12-19-2-29 FALL INTO?

⑥ SHOULD WE PROVIDE FOR A FURTHER REVIEW DATE?

BR



September 22, 1995

Mr. E. L. Doherty  
Senior Exploitation Engineer  
Manitoba/Saskatchewan Growth Team  
Home Oil Company Limited  
1600, 324 - 8th Avenue SW  
Calgary AB T2P 2Z5

Dear Mr. Doherty:

**Re: Home Oil's Pierson Field Depletion Strategy**

The Petroleum Branch is in receipt of your letter dated August 30, 1995 outlining Home's proposed depletion strategy for the Pierson Field. Home's depletion strategy indicates the company's lands can be divided into 3 categories:

- (1) lands uneconomic to develop;
- (2) lands with horizontal drilling potential; and
- (3) lands with waterflood potential.

Figure 1 shows the 3 categories of lands and the 32 ha spacing area approved under Board Order No. SU 9. Home has requested another modification of the 32 ha spacing area, to exclude the E/2 of Section 19-2-29 which contains the dual leg 2-19-2-29 horizontal well. The Branch believes it is appropriate at this time to address the continued applicability of 32 ha spacing. With implementation of the waterflood, the success of horizontal drilling, and delineation of the reservoir limits in Sections 5, 7 and 18-2-29, many of the reasons for approval of 32 ha spacing no longer apply. As illustrated on Figure 1, if 16 ha spacing is more appropriate for lands uneconomic to develop, lands with horizontal wells or horizontal drilling potential and lands with waterflood potential, then Board Order No. SU 9 should be rescinded.

The Branch does not envision any negative impact on Home's depletion strategy if 32 ha spacing approval is rescinded. Please comment by October 23, 1995 on the Branch's position and the impact of reduced 16 ha spacing on Home's depletion strategy. If you have any questions, please contact the undersigned at (204) 945-6573 or John Fox, Chief Petroleum Engineer at (204) 945-6574.

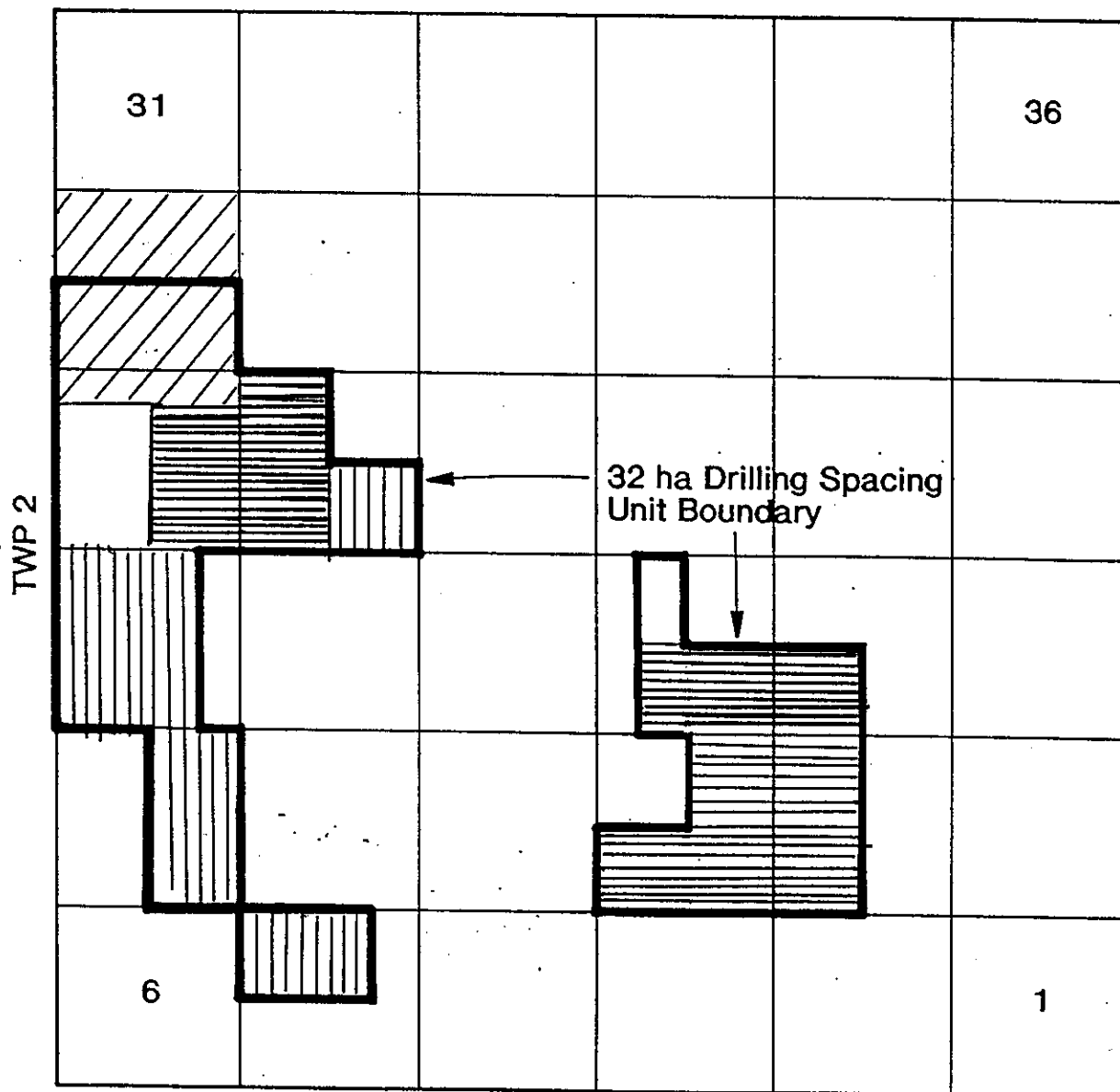
Yours truly,






L. R. Dubreuil  
Director

# BOARD ORDER NO. SU 9 SCHEDULE A - REVISED

## PIERSON AREA 32 ha DRILLING SPACING UNITS LOWER AMARANTH AND MISSION CANYON FORMATIONS



RGE 29 (WPM)

- |                                                                                                                                                  |                                                                                                          |
|--------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|
|  UNECONOMIC TO DEVELOP                                        |  WATERFLOOD POTENTIAL |
|  DEVELOPED OR PROPOSED FOR DEVELOPMENT BY HORIZONTAL DRILLING |                                                                                                          |

EFFECTIVE DATE: May 10, 1995

APPROVED: *[Signature]*  
Director of Petroleum for Minister Energy and Mines

DATE: MAY 12, 1995

FIGURE 1

- NO CONCERN WITH DELETION  
OF UNECONOMIC AREAS

- WOULD LIKE TO  
DEVELOPMENT UP 42  
AREAS IN ORDERLY  
FASHION

- APPLICATION TO  
REDUCE SPACING TO 16 ha  
IN E/2 OF SEC. 19

\$7.5M budget for fiscal 9  
STARTING NOV. 1/55



Energy and Mines

Petroleum

555 — 330 Graham Avenue  
Winnipeg, Manitoba, CANADA  
R3C 4E3

FAX NO.: (204) 945-0586

(204) 945-6577  
FAX: (204) 945-0586

DATE: SEP 7 / 95

TOTAL NO. OF PAGES (including this page) 2

PLEASE DELIVER THE FOLLOWING PAGES TO:

NAME: EUGENE DOHERTY

FROM: John N. Fox  
Chief Petroleum Engineer

BRANCH: HOME OIL CO. LTD.

BRANCH: Petroleum Branch

FAX NO: (403) 232-7678

PHONE: (204) 945-6574

COMMENTS: I'VE REVIEWED YOUR DEPLETION STRATEGY. IT APPEARS HOME IS REQUESTING  
16 ha SPACING FOR THE E/2 OF SECTION 19. BASED ON THE  
ATTACHED MAP, IF YOU EXCLUDE LANDS THAT ARE UNECONOMIC TO  
DEVELOP, LANDS WITH HORIZONTAL DRILLING POTENTIAL AND FUTURE  
WATERFLOOD EXPANSION AREA FROM THE 32 ha SPACING  
APPROVAL, NOTHING'S LEFT. LET'S TALK.

This message is intended only for the use of the individual or entity to which it is addressed, and may contain information that is privileged, confidential and exempt from disclosure under applicable law.

If the reader of this message is not the intended recipient, or the employee or agent responsible for delivering the message to the intended recipient, you are hereby notified that any dissemination, distribution or copying of this communication is strictly prohibited. If you have received this communication in error, please notify us immediately by telephone, and return the original to us by postal service at the address noted above. Thank you.

ORIGINALS WILL BE:

       Mailed to you:        Delivered to you:        Picked up  
       Mailed/Delivered upon request:        Remain on our file.



Manitoba Energy and Mines  
Petroleum Branch  
1395 Ellice Avenue  
Suite 360  
Winnipeg, Manitoba  
R3G 0G3

1995-08-30



ATTENTION : Mr. L.R. Dubreuil  
Director, Petroleum Branch

**RE: Depletion Strategy - South Pierson Field**

In the past year, Home Oil has made several applications for reduced spacing in the South Pierson area. This was done as a result of our development drilling indicating a larger Mississippian oil reserve than previously anticipated. Outside the near Unit area wells have continued to be drilled on 32 ha spacing. Figure 1.0 shows the field development to date.

Home Oil intends to apply for expansion of the waterflood area to include L.S.D.'s 9 and 16-16-002-29 W1M, 12 and 13-15-002-29 W1M and the N.W. quarter of section 10. These areas will be developed in a similar manner to the existing waterflood area. Wells at L.S.D.'s 16-16-002-29 W1M, 12-15-002-29 W1M and 14 and 12-10-002-29 W1M will be converted to water injection late this year once our application has been approved by the board.

As stated in our letter dated October 21, 1994, in order for a new waterflood area to be economically viable, the underlying Mississippian zone must be oil bearing. The waterflood expansion areas as outlined in Figure 1.0 contain regions where the Mississippian can be exploited. It is anticipated that further waterflood expansion could begin as early as 1996 in L.S.D.'s 01 and 02-002-29 W1M and 1997 for the L.S.D.'s included in sections 19 and 30-002-29 W1M. We are currently evaluating the effectiveness of the waterflood presently in place before any major expansion will occur. Thus the reason for the delay into sections 19 and 30-002-29 W1M.

In areas surrounding the Unit, the Mississippian is largely wet and cannot be developed commercially. The anhydrite between the Lower Amaranth and the Mississippian is typically thin and therefore containing a frac to the Lower Amaranth is very difficult in these cases and usually results in the frac penetrating the Mississippian yielding unwanted water production.

The remainder of the South Pierson field will continue to be developed (where possible) on 32 ha spacing. Wells in the non-waterflood area tend to be located in lower quality reservoir. Therefore there is not a large enough reserve associated with these wells to make them economically attractive. The exception to this is horizontal well development.



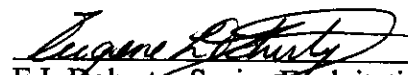
With the recent dual leg horizontal well drilling success in the east half of section 19-002-29 W1M and the re-entry in section 15-002-29 W1M, areas that are predominately wet in the Mississippian may now be exploitable using this technology. However the sand in the Lower Amaranth must be thick enough and have sufficient porosity and permeability to make horizontal drilling profitable. Any future horizontal locations drilled into the marginal areas of the field will first require a detailed analysis by Home Oil. Locations where Home Oil believes horizontal drilling may be applied are shown in Figure 2.0.

The dual leg horizontal well in section 19-002-29 W1M was drilled through some of the best quality sand in the South Pierson field. The re-entry into the well at 07-15-002-29 W1M was drilled into sand with inferior porosity and permeability characteristics. These two wells represent both ends of the horizontal development spectrum. By using underbalanced drilling techniques, Home Oil believes that some areas can be exploited horizontally that could not otherwise be done economically. In these areas we would request that the spacing unit be reduced to 16 ha as the horizontal well intersects adjoining L.S.D.'s. As is the case with the dual leg horizontal well in Section 19, Home Oil requests that the drilling spacing unit for the east half of the section be reduced to 16 ha, as the dual well intersects each L.S.D. except for the L.S.D. at 01-19 002-29 W1M.

The area proposed by the Branch for exclusion from 32 ha Spacing Areas cannot be developed economically either through waterflood expansion or horizontal drilling. The area shown in section 05-002-29 W1M is water wet. Except for the potential horizontal location in the west half of section 20-002-29 W1M, areas in sections 07, 18 and 20-002-29 W1M contain poor reservoir quality sands and would not warrant any vertical or horizontal well development at this time.

Please contact me at (403) 232-7376 if you have any questions.

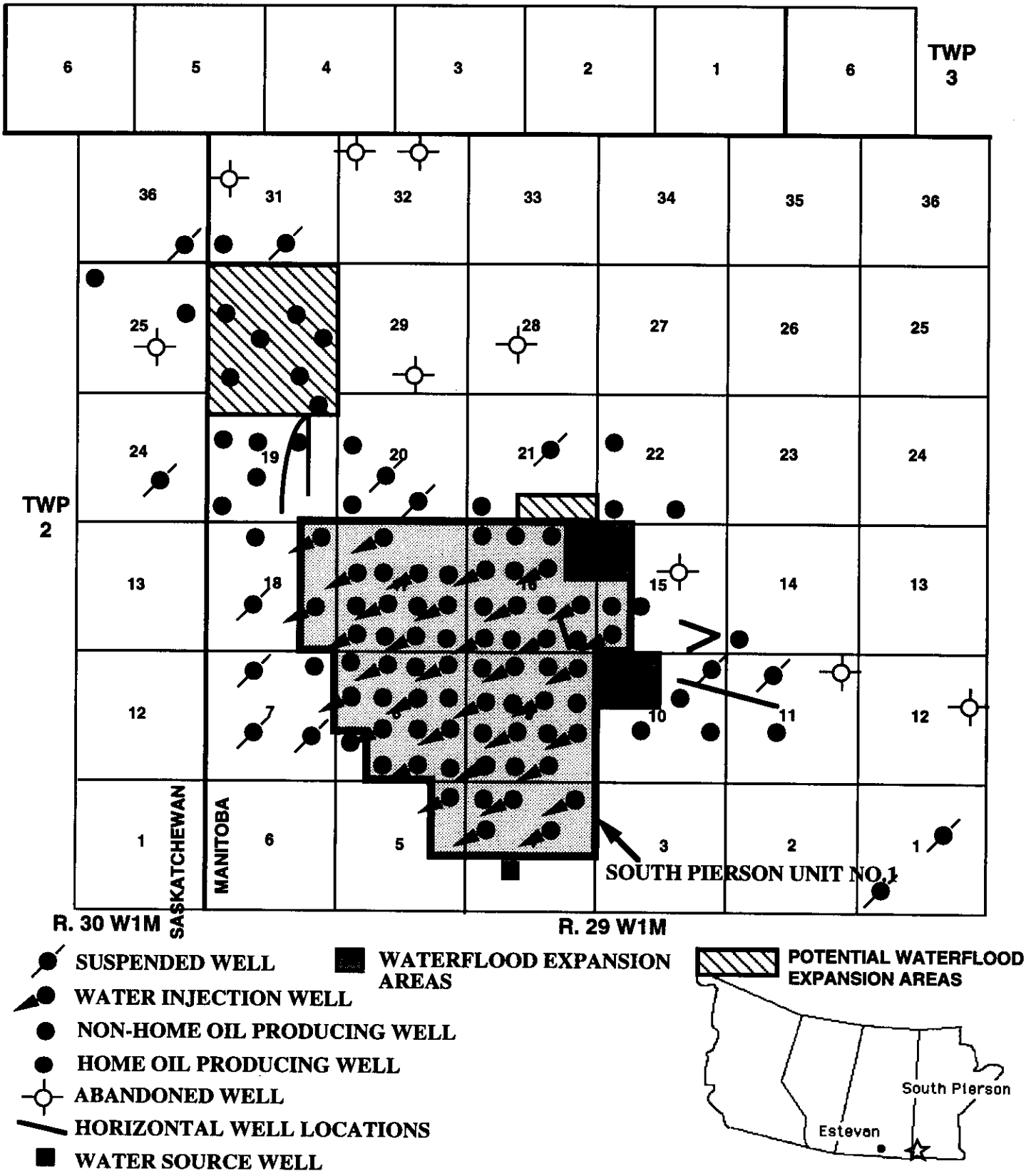
Yours truly,  
HOME OIL COMPANY LIMITED

  
E.L. Doherty, Senior Exploitation Engineer  
Manitoba/Saskatchewan Growth Team

ELD/ed

cc: R.S. Bachynski  
E.L. Doherty  
Pierson Corr.

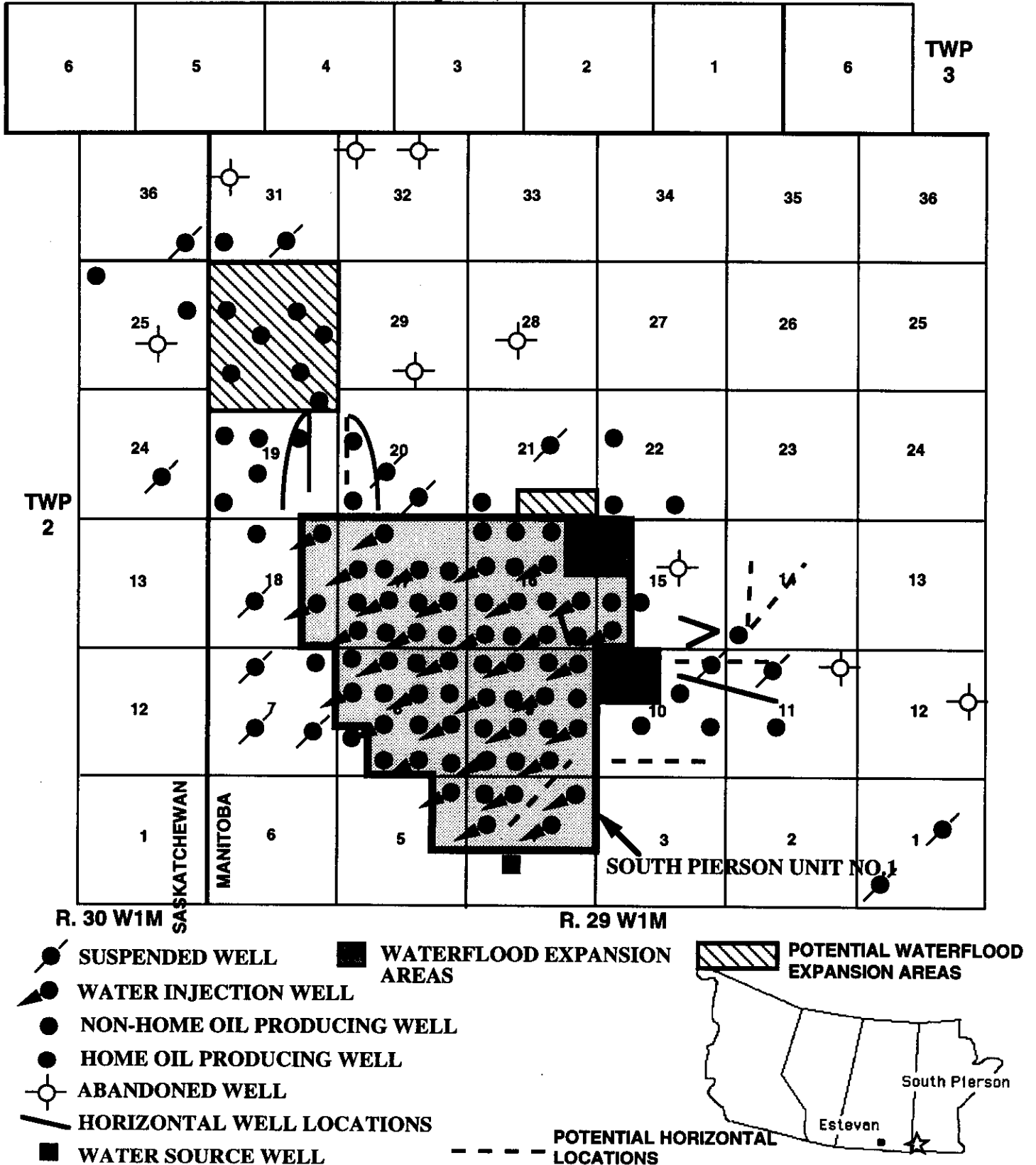
**FIGURE 1.0**  
**South Pierson Development**  
 To August 30, 1995



# FIGURE 2.0

## South Pierson Development - Potential Horizontal Locations

To August 30, 1995



MAKE COPY  
FOR POOL FILE:  
PIERSON L. ANANTH-  
MISSION CANYON 36 A POOL  
32 ha spacing

September 20, 1995

Mr. E. L. Doherty  
Senior Exploitation Engineer  
Manitoba/Saskatchewan Growth Team  
Home Oil Company Limited  
1600, 324 - 8th Avenue SW  
Calgary AB T2P 2Z5

Dear Mr. Doherty:

**Re: Home Oil's Pierson Field Depletion Strategy**

The Petroleum Branch is in receipt of your letter dated August 20, 1995 outlining Home's proposed depletion strategy for the Pierson Field. Home's depletion strategy indicates the company's lands can be divided into 3 categories:

- (1) lands uneconomic to develop;
- (2) lands with horizontal drilling potential; and
- (3) land with waterflood potential.

Figure 1 shows the 3 categories of lands and the 32 ha spacing area approved under Board Order No. SU9. Home has requested another modification of the 32 ha spacing area, to exclude the E/2 of Section 19-2-29 which contains the dual leg 2-19-2-29 horizontal well. The Branch believes it is appropriate at this time to address the continued applicability of 32 ha spacing. With implementation of the waterflood, the success of horizontal drilling and delineation of the reservoir limits in Sections 5, 7 and 18-2-29, many of the reasons for approval of 32 ha spacing no longer apply. As illustrated on Figure 1, if 16 ha spacing is appropriate for lands uneconomic to develop, lands with horizontal wells or horizontal drilling potential and lands with waterflood potential, then Board Order No. SU9 should be rescinded.

The Branch does not envision any negative impact on Home's depletion strategy if 32 ha spacing approval is rescinded. Please comment by October 23, 1995 on the Branch's position and the impact of reduced 16 ha spacing on Home's depletion strategy. If you have any questions, please contact the undersigned at (204) 945-6573 or John Fox, Chief Petroleum Engineer at (204) 945-6574.

Yours truly,

L. R. Dubreuil  
Director

# ANDERSON EXPLORATION LTD.

25 October 1995

1600 Home Oil Tower  
324 Eighth Avenue S.W.  
Calgary, Alberta T2P 2Z5  
Phone: (403) 232-7100

Manitoba Energy and Mines  
Petroleum Branch  
1395 Ellice Avenue Suite 360  
Winnipeg, MN R3G 3P2

ATTENTION: Mr. L.R. Dubreuil, Director  
Petroleum Branch

Dear Mr. Dubreuil:

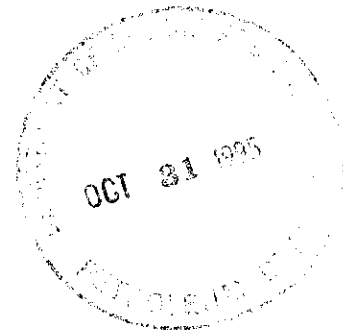
**Re: Rescission of Board Order No. SU 9**

In response to your letter dated September 22, 1995 to rescind Board Order No. SU 9, Anderson Exploration agrees that the Lands categorized as uneconomic to develop be rescinded from 32 hectare spacing. However, we request a continuance of the Board Order for the remaining Lands identified as having horizontal drilling and waterflood potential.

Anderson is reviewing the performance of the waterflood scheme within the South Pierson Unit. The communication between the Spearfish and the Alida through hydraulic fractures has posed difficulty in assessing the benefit of pressure maintenance to each zone. Since the waterflood scheme is in the early stage of implementation, no noticeable effect had been detected in the producers. Injectivity testing will be conducted in selected wells shortly, to determine water injectivity and storativity of the Spearfish and the Alida.

The waterflood study of the Pierson field indicated that injectivity of water into the Lower Amaranth will steadily decrease over time. In addition the response time is very long due to the low permeability of the rock. Unlike other waterflood schemes where the oil bank causes an increase in oil production rate, the pressure maintenance scheme in Pierson serves to slow down the decline rate. Since the waterflood scheme was fully implemented only last year, additional time is required to determine its effectiveness. To extend the waterflood scheme to the northwest requires drilling of seven infill wells. Before committing high capital expenditure to install facilities and flowlines, the economic viability of the waterflood scheme has to be evaluated.

At present there are five horizontal wells drilled in the Pierson field, as shown in Figure 1. The performance of these horizontal wells are mixed and the newer ones are still in the transient stage of production. To properly evaluate their production capability requires that they produce in the pseudo steady regime. Before committing to drill additional horizontal wells their performance need to be

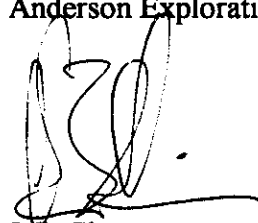


assessed against comparable vertical wells (with hydraulic treatment) producing at pseudo steady state.

By continuing Board Order SU 9, it will relieve Anderson from having to drill wells unduly based on offset notices. The additional time will enable us to properly evaluate the viability of implementing our plan as outlined in the Depletion Strategy sent to the Petroleum Branch on August 8, 1995.

If you require more information please contact the undersigned at (403)232-7352.

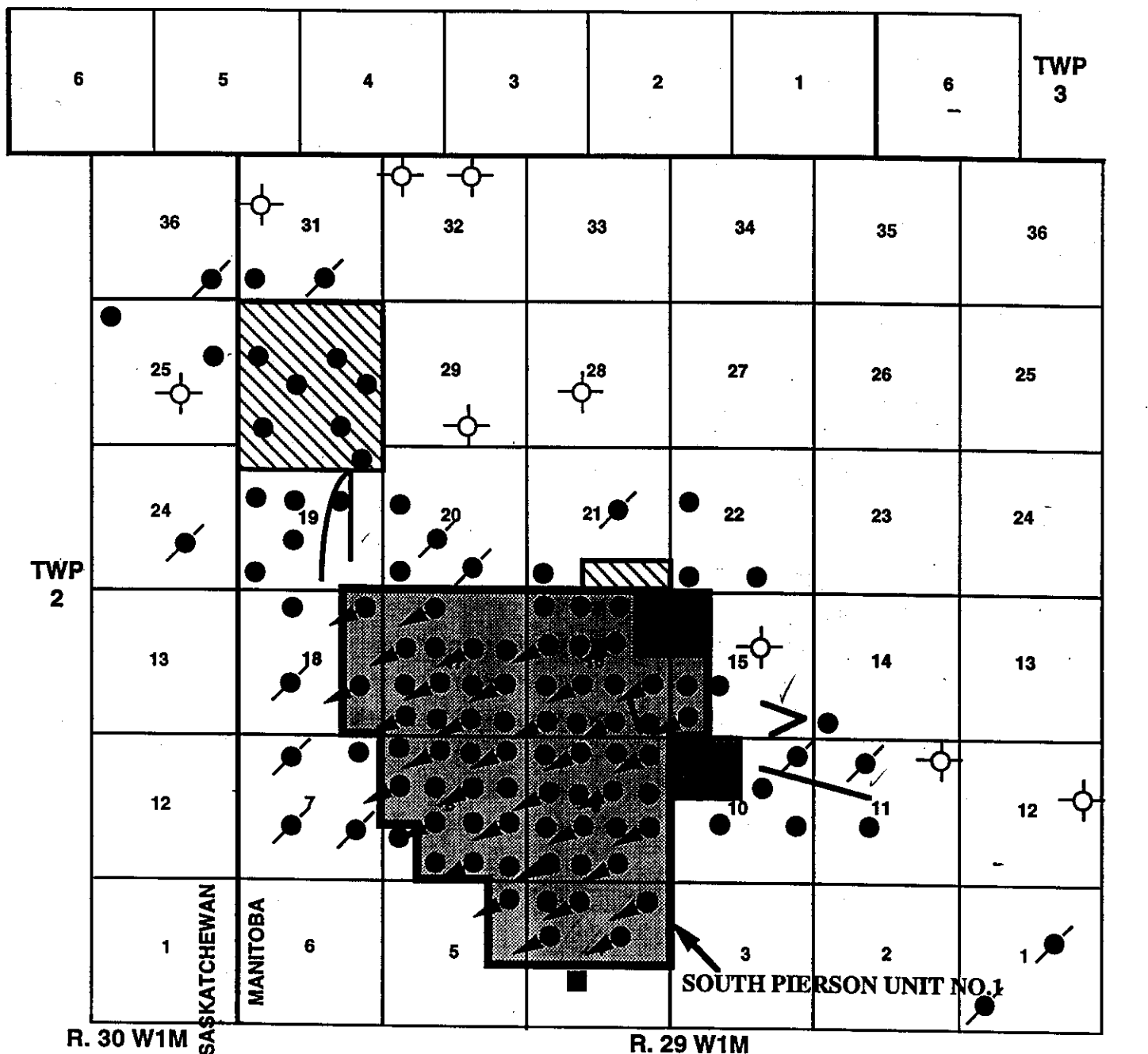
Yours truly,  
Anderson Exploration Ltd

A handwritten signature in black ink, appearing to be 'J.C. Chan', written over a horizontal line.

J.C. Chan  
Exploition Engineering

cc: A.D. Archibald  
G.J. Kuran  
E.L. Doherty

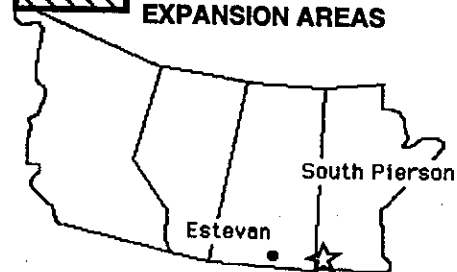
**FIGURE 1.0**  
**South Pierson Development**  
 To August 30, 1995



- SUSPENDED WELL
- WATER INJECTION WELL
- NON-HOME OIL PRODUCING WELL
- HOME OIL PRODUCING WELL
- ⊕ ABANDONED WELL
- HORIZONTAL WELL LOCATIONS
- WATER SOURCE WELL

■ WATERFLOOD EXPANSION AREAS

▨ POTENTIAL WATERFLOOD EXPANSION AREAS





## Memorandum

Date May 10, 1995

To L.R. Dubreuil  
Director  
Petroleum Branch

From John N. Fox,  
Chief Petroleum Engineer  
Petroleum Branch

Telephone

Subject **Pierson Field - Amendment to 32 ha Spacing Area**

Home Oil Company Limited has made application to amend the 32 ha spacing area approved under Board Order No. SU 9. Home plans to drill 13-15-2-29 and has requested 16 ha spacing for Lsd's 12 & 13 of Section 15-2-29.

### Recommendations

It is recommended that the 32 ha spacing area be amended to exclude Lsd's 12 & 13 of Section 15-2-29.

Attached is a letter to Home Oil requesting the company comment on the continued appropriateness of 32 ha spacing in the Pierson Field.

### Discussion

Home's application to amend the 32 ha spacing area covered by Board Order No. SU 9 is the company's fifth in the last 2 1/2 years.

When SU 9 was issued in January 1993 an attempt was made to include all lands identified by Home as having waterflood potential. Approval of increased spacing allowed for the orderly development of these lands and helped to slow the rate of reservoir depletion. At the time of approval undeveloped land at or near the productive limits of the Lower Amaranth and developed lands where wells had not demonstrated the capability of draining 32 ha were excluded from SU 9.

Since January 1993, Home has drilled over 50 wells in and around the 32 ha spacing area. These additional wells were reviewed to evaluate the continued appropriateness of 32 ha spacing. Figure 1 shows the 32 ha spacing outline and individual well current and cumulative production. The drilling and production data suggests the lands highlighted on Figure 1 could be removed from the 32 ha spacing area.

Home has indicated that it plans to expand the waterflood this year to include the NW/4 of Section 10, Lsd's 12 & 13 in Section 15 and Lsd's 9 and 16 in Section 16. Future expansion plans, as outlined in Home's original waterflood application include all or parts of Sections 7, 10, 11, 14, 15, 18, 19, 20 and 30 (see

First | Fold

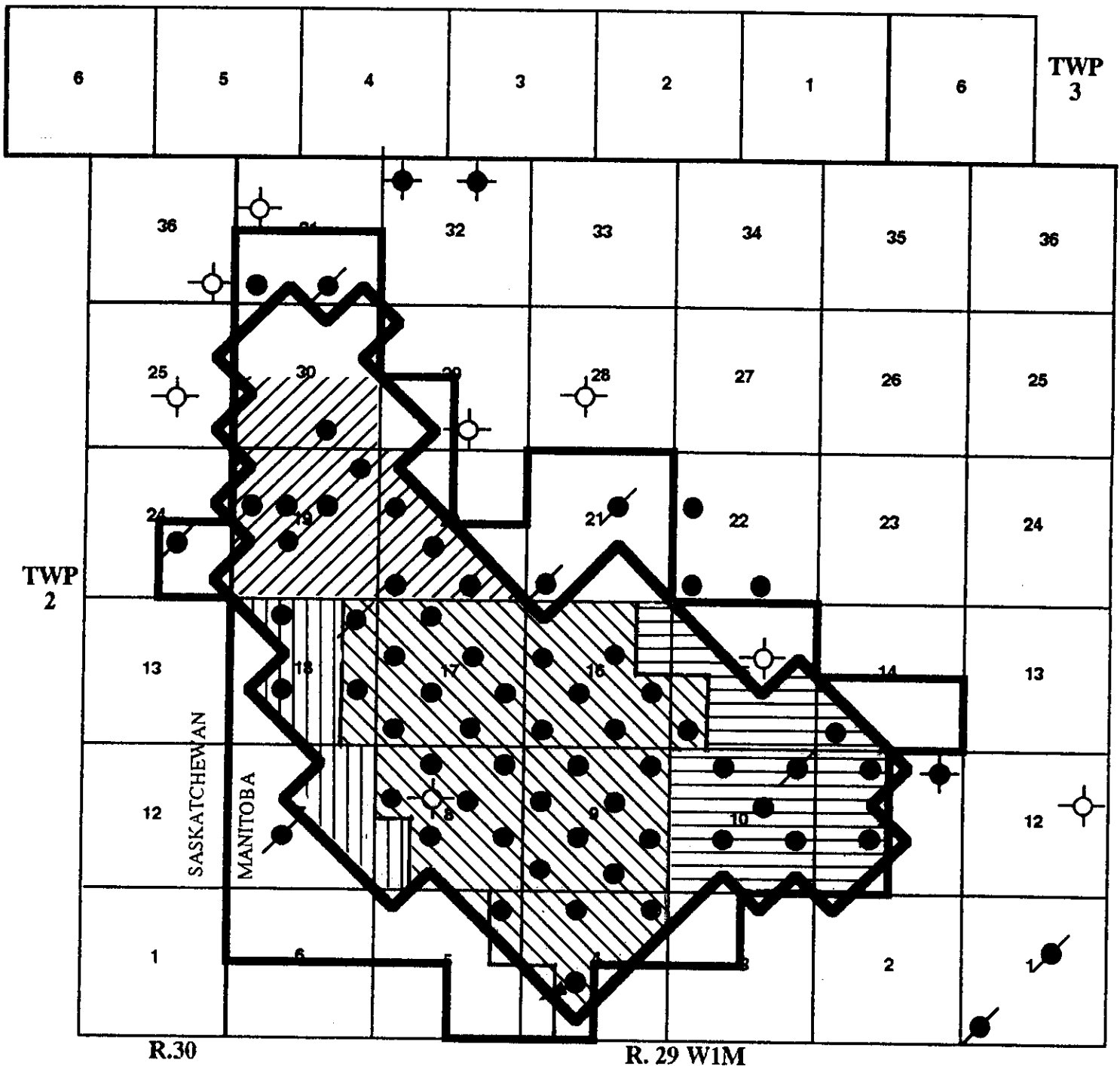


Figure 2). It is recommended that Home's application be approved and the company be requested to comment on it's future waterflood plans and the continued appropriateness of 32 ha spacing in both the proposed waterflood and non-waterflood areas. A copy of the proposed letter to Home Oil is attached.



FIGURE 2

# PIERSON AREA



— Project Area

— Waterflood Area

● CURRENT WELLS

● H2O DISP. WELL

PHASE I



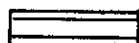
PHASE II



PHASE III



PHASE IV





May 11, 1995

Mr. G.C.K. Johnson  
Co-ordinator, Oil Division  
Home Oil Company Limited  
1600 Home Oil Tower  
324 - 8th Avenue SW  
Calgary AB T2P 2Z5

Dear Mr. Johnson:

Re: Pierson Field - Amendment of 32 ha Spacing Area

The Branch is in receipt of your application to amend the 32 ha spacing area approved under Board Order No. SU 9. In accordance with Clause 3 of Board Order No. SU 9, Schedule A is amended as attached, to exclude Lsd's 12 & 13 of Section 15-2-29 (WPM).

Home's application to amend the 32 ha spacing area covered by Board Order No. SU 9 is the company's fifth in the last 2 1/2 years.

When SU 9 was issued in January 1993 an attempt was made to include all lands identified by Home as having waterflood potential. Approval of increased spacing allowed for the orderly development of these lands and helped to slow the rate of reservoir depletion. At the time of approval undeveloped land at or near the productive limits of the Lower Amaranth and developed lands where wells had not demonstrated the capability of draining 32 ha were excluded from SU 9.

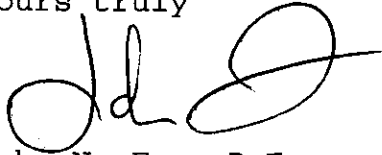
Since January 1993, Home has drilled over 50 wells in and around the 32 ha spacing area. These additional wells were reviewed to evaluate the continued appropriateness of 32 ha spacing. The drilling and production data suggests the lands highlighted on Figure 1 could be removed from the 32 ha spacing area.

Home has indicated that it plans to expand the waterflood this year to include the NW/4 of Section 10, Lsd's 12 & 13 in Section 15 and Lsd's 9 and 16 in Section 16. Future expansion plans, as outlined in Home's original waterflood application included all or parts of Sections 7, 10, 11, 14,

15, 18, 19, 20 and 30. Home is requested to comment by August 31, 1995, on it's future waterflood plans and the continued appropriateness of 32 ha spacing in both the proposed waterflood and non-waterflood areas.


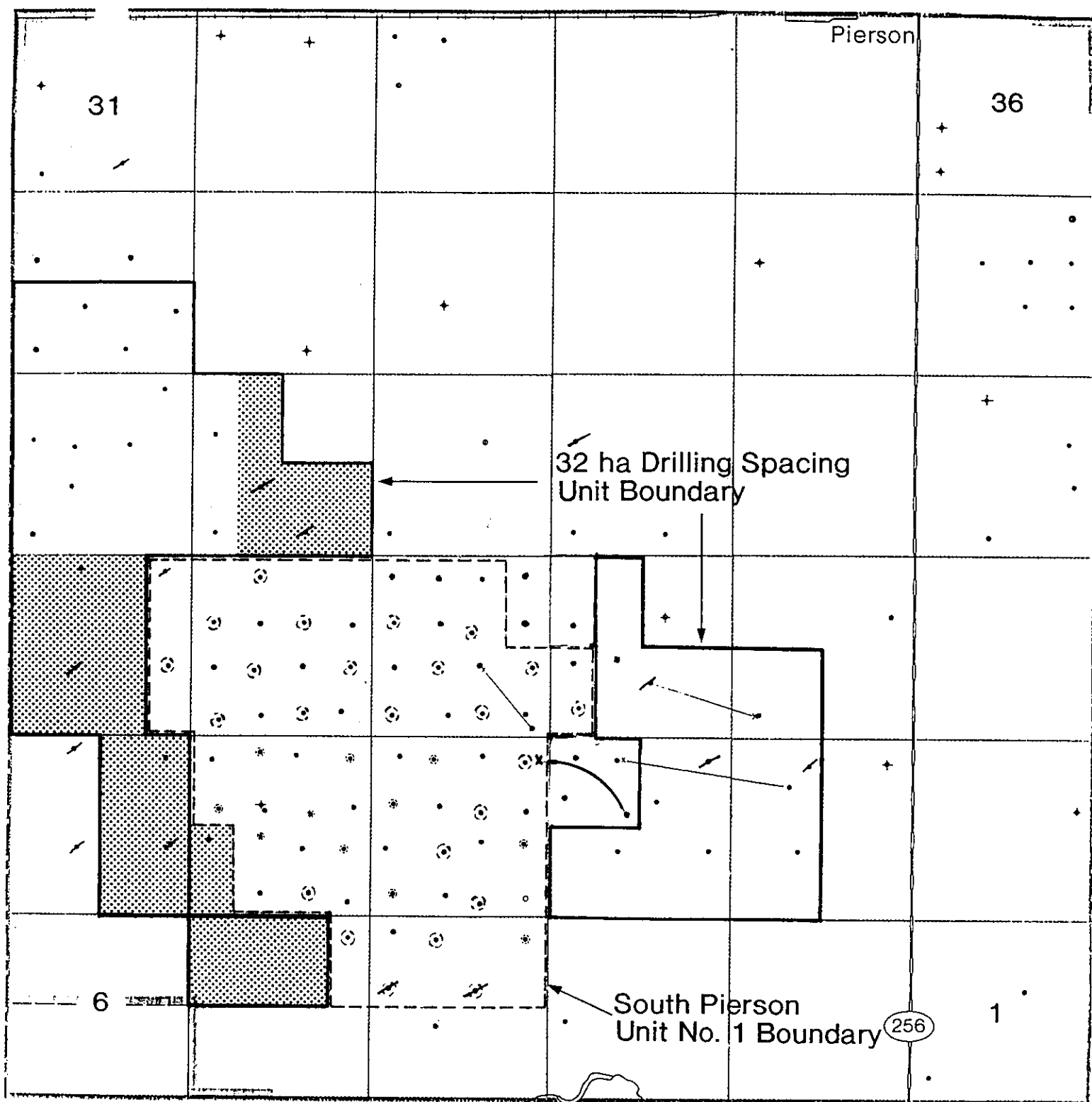
If you have any questions in respect of this matter please contact the undersigned at (204) 945-6574.

Yours truly

A handwritten signature in black ink, appearing to be 'J. N. Fox', with a large, stylized loop at the end.

John N. Fox, P.Eng.  
Chief Petroleum Engineer

## FIGURE 1



**Lands proposed by the Branch for exclusion from 32 ha Spacing Area**

**PIERSON AREA**  
**32 ha DRILLING SPACING UNITS**  
**LOWER AMARANTH AND MISSION CANYON FORMATIONS**



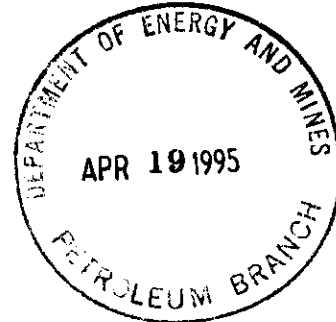
# Home Oil Company Limited

1600 Home Oil Tower  
324 Eighth Avenue S.W.  
Calgary, Alberta T2P 2Z5  
Telephone (403) 232-7100  
Fax (403) 232-7678



Manitoba Energy and Mines  
Petroleum Branch  
1395 Ellice Avenue  
Suite 360  
Winnipeg, Manitoba  
R3G 0G3

1995-04-18



ATTENTION: Mr. L.R.Dubreuil  
Director, Petroleum Branch

**RE: Application For Reduced Spacing - South Pierson L.S.D. 13-15-002-29 W1M**

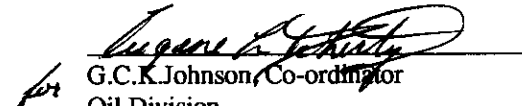
Home Oil Company Limited, as Operator of the South Pierson field, requests that the location at 13-15-002-29 W1M be granted reduced spacing to 16 ha in order to drill the well. The well will be part of the waterflood expansion as per our correspondence of October 21, 1994 in which we outlined our depletion strategy for the South Pierson field.

As stated in our October 21, 1994 letter, our development drilling program has given us a greater understanding of the complex geology in the area. In order for a new waterflood area to be economically viable, the Mississippian zone must be oil bearing. This is the case in most of the Unit area as it is presently defined. The waterflood expansion areas as outlined in Figure 1.0 contain regions where the Mississippian can be exploited. Therefore a reduced spacing unit is warranted in these areas.

Home Oil plans to make an application to expand the waterflood area later this summer. We would like to drill the 13-15 now to take advantage of a drilling rig we have at our disposal once break-up is over. We intend to resume drilling before the end of April and therefore request that our application be given due consideration.

Please contact me at (403) 232-7370 or E.L.Doherty at (403) 232-7376 if you have any questions.

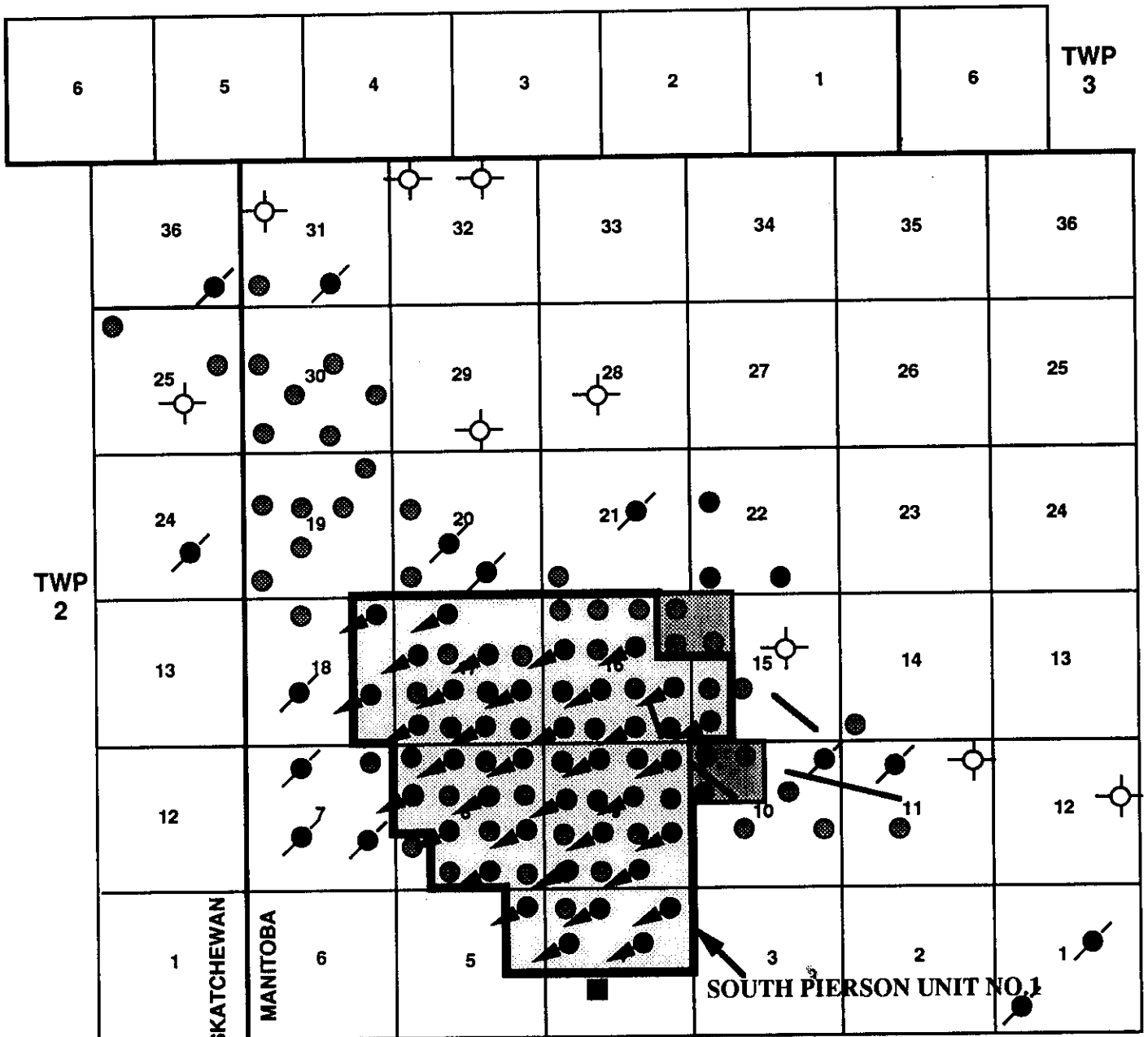
Yours truly,  
HOME OIL COMPANY LIMITED

  
G.C.K. Johnson, Co-ordinator  
Oil Division

GCKJ/ed  
cc: G.C.K. Johnson  
E.L. Doherty  
D.W. White  
Pierson Corr

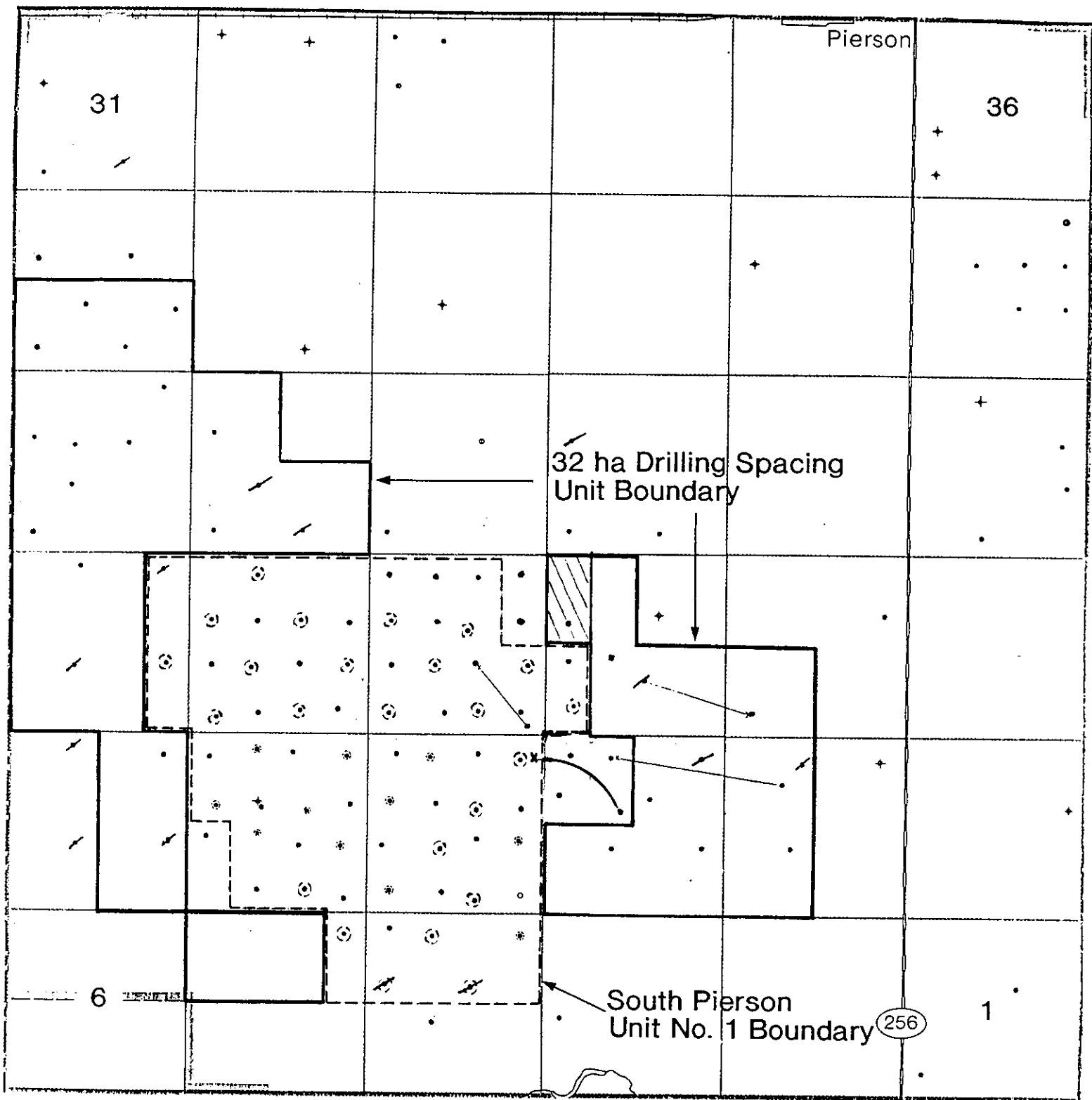


**FIGURE 1.0**  
**South Pierson Development**  
 To April 18, 1995



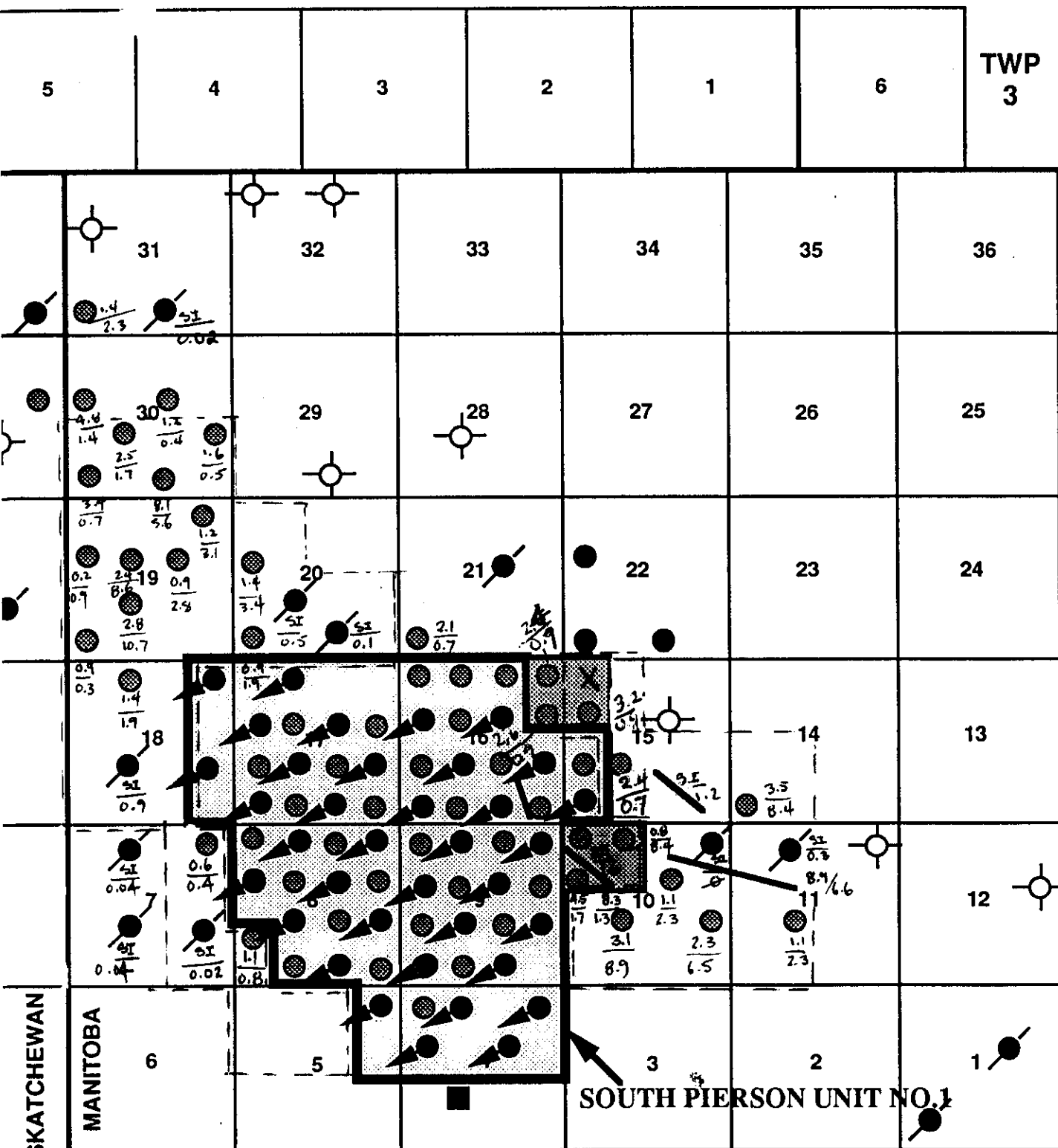
- R. 30 W1M**      **R. 29 W1M**
- SUSPENDED WELL**
  - WATER INJECTION WELL**
  - NON-HOME OIL PRODUCING WELL**
  - HOME OIL PRODUCING WELL**
  - ABANDONED WELL**
  - HORIZONTAL WELL LOCATIONS**
  - WATER SOURCE WELL**
  - WATERFLOOD EXPANSION AREAS**





# South Pierson Development

To April 18, 1995

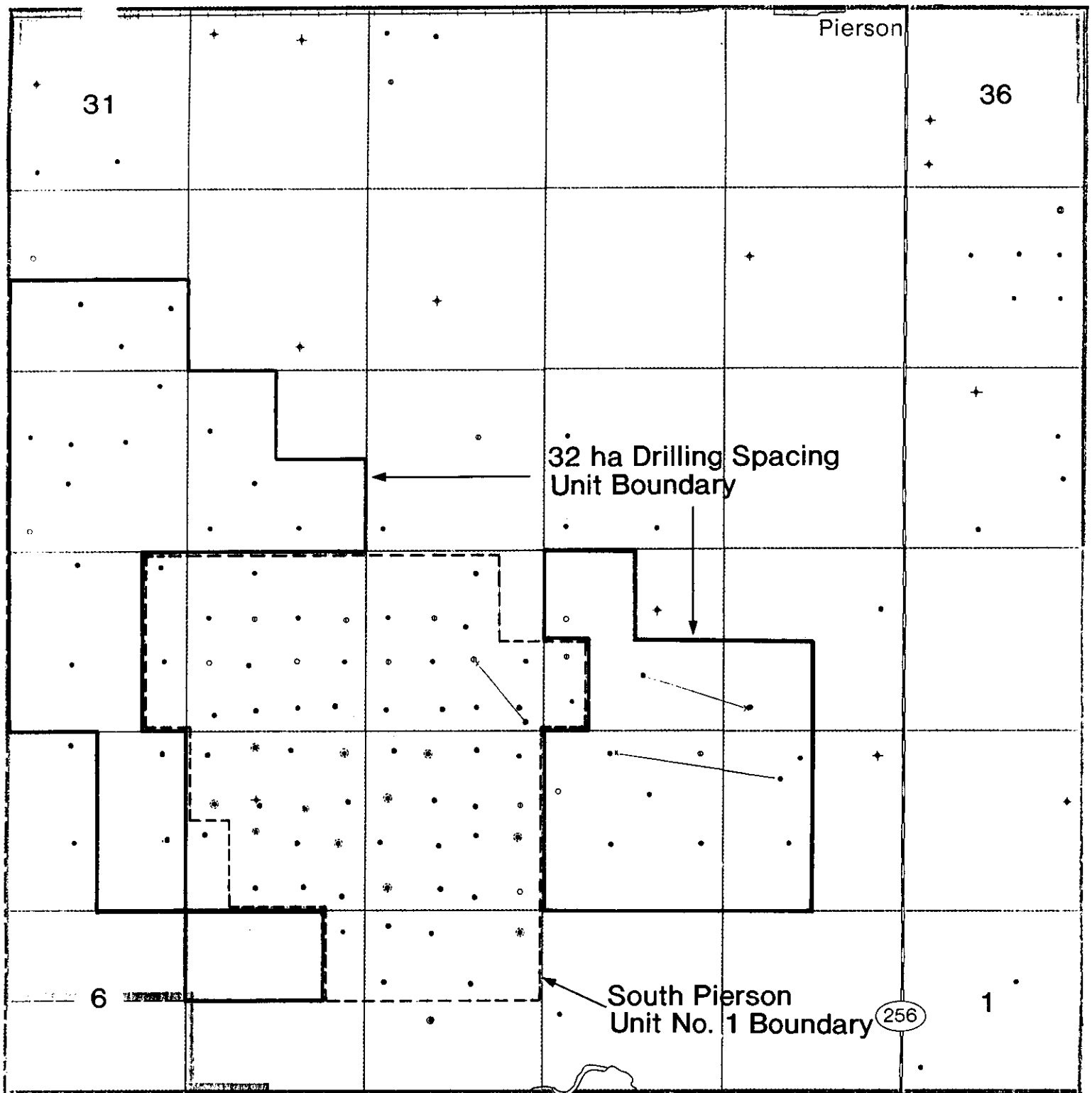


R. 29 W1M

- PRODUCING WELL
- INJECTION WELL
- OME OIL PRODUCING WELL
- OIL PRODUCING WELL
- ONED WELL
- ONTAL WELL LOCATIONS

● DAILY PROD  $m^3/d$   
 CURTIL. PROD  $10^3 m^3$





## Home Oil Company Limited

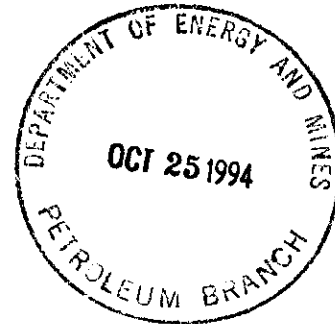
1600 Home Oil Tower  
324 Eighth Avenue S.W.  
Calgary, Alberta T2P 2Z5  
Telephone (403) 232-7100  
Fax (403) 232-7678



Manitoba Energy and Mines  
Petroleum Branch  
1395 Ellice Avenue  
Suite 360  
Winnipeg, Manitoba  
R3G 0G3

1994-10-21

ATTENTION : Mr. L.R.Dubreuil  
Director, Petroleum Branch



**RE: Depletion Strategy - South Pierson Field**

In the past year, Home Oil has made several applications for reduced spacing in the South Pierson area. This was done as a result of our development drilling indicating a larger Mississippian oil reserve than previously anticipated. Outside the near Unit area wells have continued to be drilled on 32 ha spacing. Figure 1.0 shows the field development to date.

Home Oil intends to apply for expansion of the waterflood area to include L.S.D.'s 9 and 16-16-002-29 W1M, 12 and 13-15-002-29 W1M and the N.W. quarter of section 10. These areas will be developed in a similar manner to the existing waterflood area. The expansion will require the drilling of the L.S.D. at 13-15-002-29 W1M and possibly the L.S.D. at 11-10-002-29 W1M. The latter may not be drilled depending on the remedial completion that will be done on the horizontal well at 11-10-002-29 W1M. Currently it is planned to fracture stimulate this well. Technical considerations are being given to pattern sweep efficiencies as well as probable success of such a stimulation treatment.

Four wells will also be converted to injection, 16-16-002-29 W1M, 12-15-002-29 W1M, 14-10-002-29 W1M and 12-10-002-29 W1M. Depending on the results of the remedial completion at the horizontal well at 11-10, this well may also be converted to injection.


The remainder of the South Pierson field will continue to be developed (where possible) on 32 ha spacing. Wells in the non-waterflood area tend to be located in lower quality reservoir. Therefore there is not a large enough reserve associated with these wells to make them economically attractive. The two exceptions to drilling on 32 ha spacing in the non-waterflood area are first the application of future enhanced recovery schemes and secondly horizontal development.

In order for a new waterflood area to be economically viable, the Mississippian zone must be oil bearing. This is the case in most of the Unit area as it is presently defined. The waterflood expansion areas as outlined in Figure 1.0 contain regions where the Mississippian can be exploited. In areas surrounding the Unit, the Mississippian is largely wet and cannot be developed commercially. The anhydrite between the Lower Amaranth and the Mississippian is typically thin and therefore containing a frac to the Lower Amaranth is very difficult in these cases and usually results in the frac penetrating the Mississippian yielding unwanted water production.

In these areas, horizontal drilling is the best alternative for future development of the resource. However the 'C' sand in the Lower Amaranth must be thick enough to allow for enough oil volumes to make horizontal drilling profitable. Such areas where horizontal drilling may be applied are in the south half of section 10 and areas in sections 19 and 30.

Please contact me at (403) 232-7370 or E.L.Doherty at (403) 232-7376 if you have any questions.

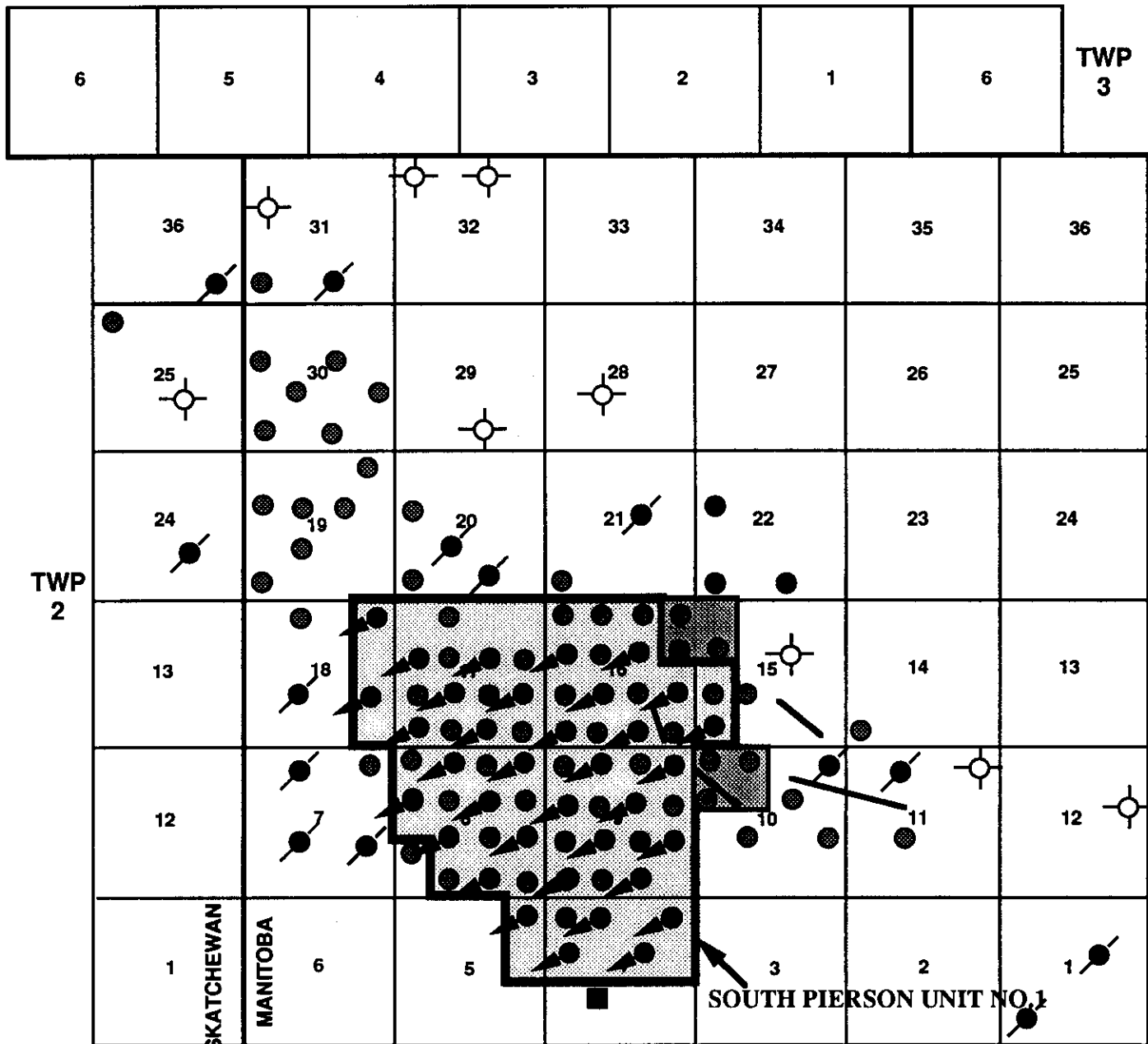
Yours truly,  
HOME OIL COMPANY LIMITED

  
\_\_\_\_\_  
G.C.K. Johnson, Coordinator  
Oil Division

GCKJ/ed

cc: G.C.K. Johnson  
E.L.Doherty  
Pierson Corr.

**FIGURE 1.0**  
**South Pierson Development**  
 To October 21 1994



- R. 30 W1M      R. 29 W1M
- / SUSPENDED WELL
  - → WATER INJECTION WELL
  - NON-HOME OIL PRODUCING WELL
  - HOME OIL PRODUCING WELL
  - ⊕ ABANDONED WELL
  - / — HORIZONTAL WELL LOCATIONS
  - WATER SOURCE WELL
  - WATERFLOOD EXPANSION AREAS





## Memorandum

Date July 4, 1994

To Bob Dubreuil  
Director  
Petroleum Branch

From John N. Fox,  
Chief Petroleum Engineer  
Petroleum Branch

Subject **Application to Modify 32 ha Spacing**  
**Pierson Area**

Telephone

Home Oil has applied to modify the 32 ha spacing area approved under Board Order No. SU 9. Clause 3 of the order provides for the spacing area to be modified from time to time to meet changing conditions.

The reason Home wishes to return to 16 ha spacing in the NW/4 of Section 10-2-29 is to exploit the Mission Canyon with a vertical well at 13-10 and to drill a horizontal well from 13-10 to 11-10 in the L.Amaranth.

It is recommended that the spacing be modified as outlined in Figure 1 and Schedule A. The attached letter of approval requests Home submit its depletion strategy for the L.Amaranth and Mission Canyon prior to requesting further changes to the spacing area.

John N. Fox

JNF

APPROVED & July 5, 1994



**Home Oil Company Limited**

*Pierson - Carr*  
1600 H. H. Oil Tower  
324 Eglar Avenue S.W.  
Calgary, Alberta T2P 2Z5  
Telephone (403) 232-7100  
Fax (403) 232-7678

Department of Energy and Mines  
Petroleum Branch  
555 - 330 Graham Avenue  
Winnipeg, Manitoba

1994-06-24

ATTENTION : Mr. L.R.Dubreuil  
Director, Petroleum Branch

**RE: Application For Reduced Spacing - South Pierson NW 10-002-29 W1M**


Home Oil Company Limited, as Operator of the South Pierson field request that the locations at 13-10-002-29 W1M and 11-10-002-29 W1M be granted a licence to drill a horizontal well intersecting the two L.S.D.'s. Under Board Order SU No.9, Home Oil is making an application to change the spacing to 16 ha for L.S.D.'s 11-10, 12-10, 13-10 and 14-10-002-29 W1M so that a horizontal well may be drilled from L.S.D. 13-10 to L.S.D. 11-10-002-29 W1M.

Development drilling within area has increased our understanding of the complex geology of the South Pierson field. Recent results from the well drilled at 12-10 indicates that the 'C' sand in the Lower Amaranth is well developed. Unfortunately the oil bearing zone in the Mississippian is almost completely diminished. Therefore any completion to the south and east from 12-10 will have to be contained in the Lower Amaranth. Past experience indicates that no matter how small of a frac is designed for completing wells in section 10, breakthrough of water is almost certain. Given the positive results from the horizontal well drilled last year at 11-11-002-29 W1M, Home Oil wishes to drill another horizontal well from 13-10 to 11-10 with similar results expected.

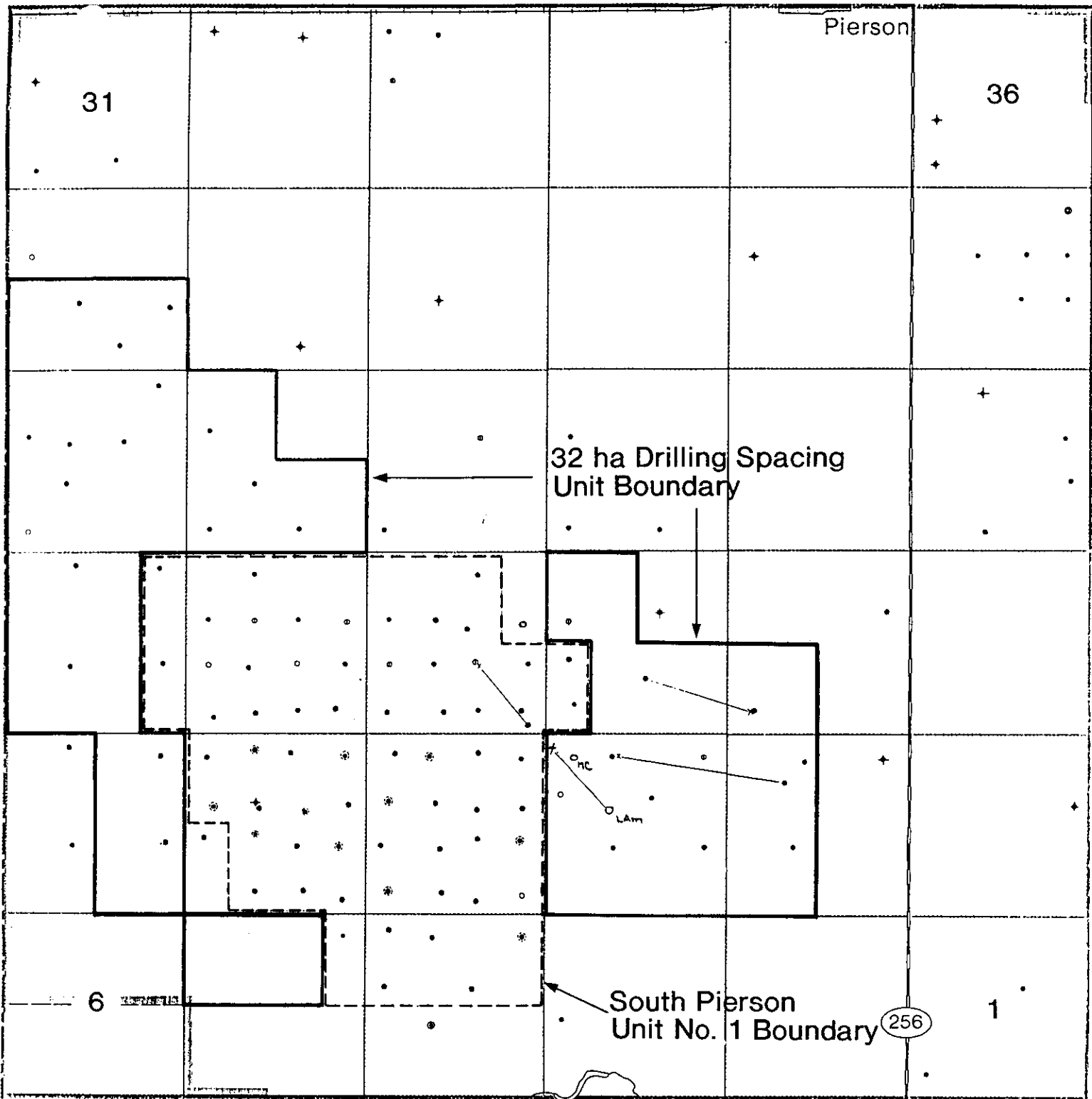
As 12-10 has oil pay in the Mississippian, Home Oil also wishes to drill the 16 ha spacing unit at 13-10. It is suspected that there may be significant Mississippian oil potential at this location. The only way in which to contact these reserves will be to drill a well. Once the Mississippian pool boundaries have been fully defined outside the Unit area, consideration will be given to expanding the waterflood to include these areas. As the waterflood is developed on 16 ha spacing, surrounding areas will also have to be developed on the same spacing in order to maintain proper areal sweep efficiencies. Drilling the N.W. quarter of section 10 as well as the N.E. quarter of section 16 is the first step in increasing recoverable reserves in this area of the field. The impact of interference from the proposed horizontal well from 13-10 to 11-10 will be minimal in a waterflood scenario as the technical evaluation of the Lower Amaranth indicates that time to breakthrough is approximately 13.5 years. Therefore radial flow will be well established within the reservoir and areal sweep may actual improve as there is a constant drainage point all along the flow boundary between wells. Therefore water being injected will be drawn further into the reservoir before breaking through at a producer.

Please contact me at (403) 232-7370 or E.L.Doherty at (403) 232-7376 if you have any questions.

Yours truly,  
HOME OIL COMPANY LIMITED

  
G.C.K. Johnson, Co-ordinator  
Oil Division

GCKJ/ed



July 5, 1994

Mr. G.C.K. Johnson, Coordinator  
Oil Division  
Home Oil Company Limited  
1600 Home Oil Tower  
324 - 8th Avenue SW  
Calgary AB T2P 2Z5

Dear Mr. Johnson:

**RE: Modification of Board Order No. SU 9**

The Branch is in receipt of your application to modify the 32 ha spacing area approved under Board Order No. SU 9. In accordance with Clause 3 of Board Order No. SU 9, Schedule A is modified as attached, to exclude the NW/4 of Section 10-2-29 (WPM).

This is the third change to the 32 ha spacing area since September 1993. Prior to applying for further changes to the spacing area, Home is requested to provide the Branch with comments on the continued appropriateness of 32 ha spacing in the Pierson area. The comments should include a discussion of Home's depletion strategy for both the Lower Amaranth and Mission Canyon formations and the potential for expansion of the waterflood. You are also reminded that a pressure maintenance progress report for 1993 under Clause 7 of Board Order No. PM 70 was due April 1, 1994. The requirements for the progress report are outlined in Section 73 of the new Drilling and Production Regulation.

If you have any questions in respect of this matter, please contact John N. Fox, Chief Petroleum Engineer at (204) 945-6574.

Yours truly,

Original Signed  
L. R. DUBREUIL

L.R. Dubreuil  
Director of Petroleum

PIERSON AREA  
32 ha DRILLING SPACING UNITS  
LOWER AMARANTH AND MISSION CANYON FORMATIONS



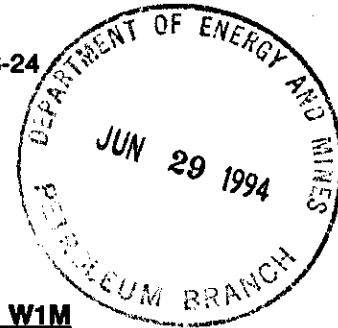
## Home Oil Company Limited

1600 Home Oil Tower  
324 Eighth Avenue S.W.  
Calgary, Alberta T2P 2Z5  
Telephone (403) 232-7100  
Fax (403) 232-7678



Department of Energy and Mines  
Petroleum Branch  
555 - 330 Graham Avenue  
Winnipeg, Manitoba

1994-06-24



ATTENTION : Mr. L.R.Dubreuil  
Director, Petroleum Branch

**RE: Application For Reduced Spacing - South Pierson NW 10-002-29 W1M**


Home Oil Company Limited, as Operator of the South Pierson field request that the locations at 13-10-002-29 W1M and 11-10-002-29 W1M be granted a licence to drill a horizontal well intersecting the two L.S.D.'s. Under Board Order SU No.9, Home Oil is making an application to change the spacing to 16 ha for L.S.D.'s 11-10, 12-10, 13-10 and 14-10-002-29 W1M so that a horizontal well may be drilled from L.S.D. 13-10 to L.S.D. 11-10-002-29 W1M.

Development drilling within area has increased our understanding of the complex geology of the South Pierson field. Recent results from the well drilled at 12-10 indicates that the 'C' sand in the Lower Amaranth is well developed. Unfortunately the oil bearing zone in the Mississippian is almost completely diminished. Therefore any completion to the south and east from 12-10 will have to be contained in the Lower Amaranth. Past experience indicates that no matter how small of a frac is designed for completing wells in section 10, breakthrough of water is almost certain. Given the positive results from the horizontal well drilled last year at 11-11-002-29 W1M, Home Oil wishes to drill another horizontal well from 13-10 to 11-10 with similar results expected.

As 12-10 has oil pay in the Mississippian, Home Oil also wishes to drill the 16 ha spacing unit at 13-10. It is suspected that there may be significant Mississippian oil potential at this location. The only way in which to contact these reserves will be to drill a well. Once the Mississippian pool boundaries have been fully defined outside the Unit area, consideration will be given to expanding the waterflood to include these areas. As the waterflood is developed on 16 ha spacing, surrounding areas will also have to be developed on the same spacing in order to maintain proper areal sweep efficiencies. Drilling the N.W. quarter of section 10 as well as the N.E. quarter of section 16 is the first step in increasing recoverable reserves in this area of the field. The impact of interference from the proposed horizontal well from 13-10 to 11-10 will be minimal in a waterflood scenario as the technical evaluation of the Lower Amaranth indicates that time to breakthrough is approximately 13.5 years. Therefore radial flow will be well established within the reservoir and areal sweep may actual improve as there is a constant drainage point all along the flow boundary between wells. Therefore water being injected will be drawn further into the reservoir before breaking through at a producer.

Please contact me at (403) 232-7370 or E.L.Doherty at (403) 232-7376 if you have any questions.

Yours truly,  
HOME OIL COMPANY LIMITED

  
G.C.K. Johnson, Co-ordinator  
Oil Division

GCKJ/ed



The Oil and Natural Gas  
Conservation Board

555 — 330 Graham Avenue  
Winnipeg MB R3C 4E3  
CANADA

(204) 945-1111  
FAX: (204) 945-0586

June 13, 1994

Mr. G.C.K. Johnson, Co-ordinator  
Oil Division  
Home Oil Company Limited  
1600 Home Oil Tower  
324 - 8th Avenue SW  
Calgary AB T2P 2Z5

Dear Mr. Johnson:

Re: Modification of Board Order No. SU 9

The Board is in receipt of your application to modify the 32 spacing area approved under Board Order No. SU 9. In accordance with Clause 3 of Board Order No. SU 9, Schedule A is modified as attached, to exclude LSD's 9 and 16 of Section 16-2-29 WPM.

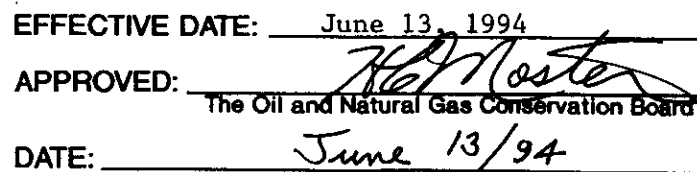
If you have any questions please contact John N. Fox, Chief Petroleum Engineer at (204) 945-6574.

Yours respectfully,

A handwritten signature in black ink, appearing to read "H. Clare Moster". The signature is fluid and cursive, with a large, sweeping flourish at the end.

H. Clare Moster  
Deputy Chairman

PIERSON AREA  
32 ha DRILLING SPACING UNITS  
LOWER AMARANTH AND MISSION CANYON FORMATIONS





Date June 6, 1994

## Memorandum

To The Oil and Natural Gas  
Conservation Board  
- Clare Moster, Deputy Chairman


From John N. Fox  
Chief Petroleum Engineer

Subject **Application to Modify 32 ha Spacing Area - Pierson Field** <sup>Telephone</sup>

Home Oil has applied to modify the 32 ha spacing area approved under Board Order No. SU 9. Clause 3 of the order provides for the spacing area to be modified by the Board from time to time to meet changing circumstances.

The reason Home wishes to return to 16 ha spacing is to exploit the Mission Canyon pool underlying parts of Sections 15 and 16. Under the new Oil and Gas Act, the Branch will be asking Home to comment on the continued appropriateness of 32 ha spacing in the Pierson area.

It is recommended that the spacing area be modified as outlined in the attached letter and shown on Schedule A.

  
John N. Fox

Original Signed By  
L.R. Dubreuil

Recommended for Approved: \_\_\_\_\_  
L.R. Dubreuil, Director

JNF/hw





The Oil and Natural Gas  
Conservation Board

555 — 330 Graham Avenue  
Winnipeg MB R3C 4E3  
CANADA

(204) 945-1111  
FAX: (204) 945-0586

Mr. G.C.K. Johnson, Co-ordinator  
Oil Division  
Home Oil Company Limited  
1600 Home Oil Tower  
324 - 8th Avenue SW  
Calgary AB T2P 2Z5

Dear Mr. Johnson:

Re: Modification of Board Order No. SU 9

The Board is in receipt of your application to modify the 32 spacing area approved under Board Order No. SU 9. In accordance with Clause 3 of Board Order No. SU 9, Schedule A is modified as attached, to exclude LSD's 9 and 16 of Section 16-2-29 WPM.

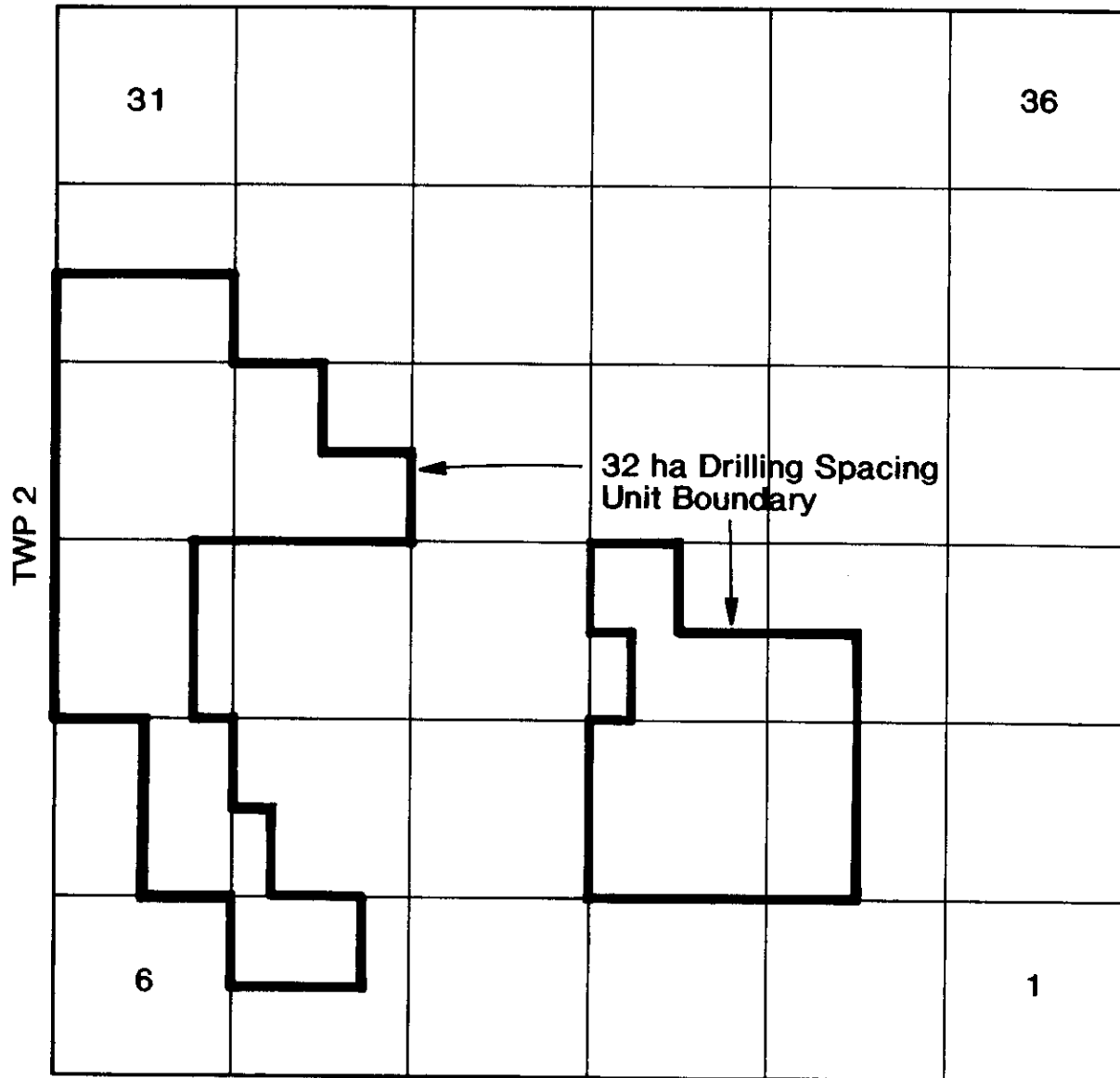
If you have any questions please contact John N. Fox, Chief Petroleum Engineer at (204) 945-6574.

Yours respectfully,

H. Clare Moster  
Deputy Chairman

**BOARD ORDER NO. SU 9  
SCHEDULE A – REVISED**

**PIERSON AREA  
32 ha DRILLING SPACING UNITS  
LOWER AMARANTH AND MISSION CANYON FORMATIONS**

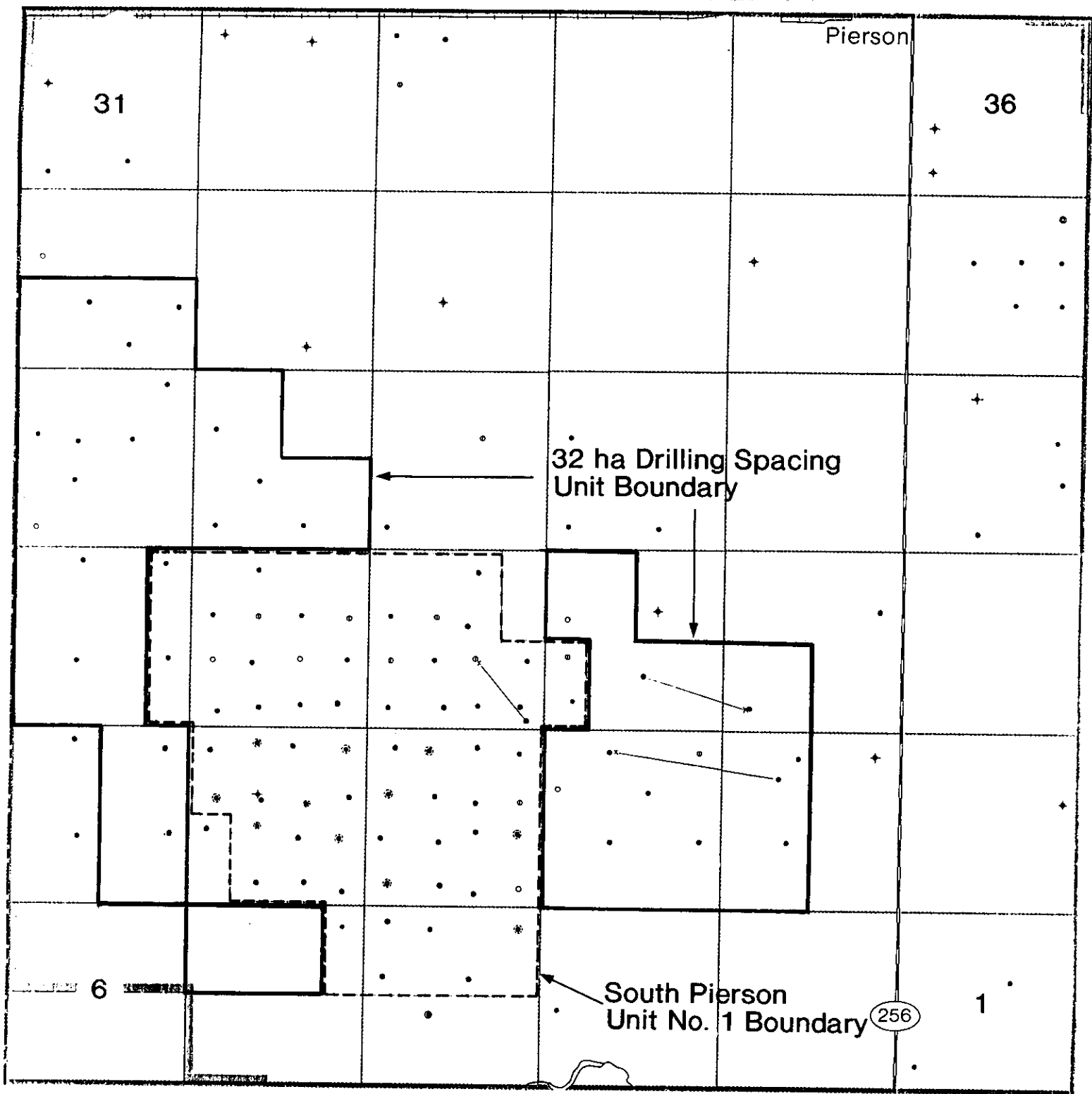


**RGE 29 (WPM)**

**EFFECTIVE DATE:** \_\_\_\_\_

**APPROVED:** \_\_\_\_\_  
The Oil and Natural Gas Conservation Board

**DATE:** \_\_\_\_\_



**Home Oil Company Limited**

1600 Home Oil Tower  
324 Eighth Avenue S.W.  
Calgary, Alberta T2P 2Z5  
Telephone (403) 232-7100  
Fax (403) 232-7678



1994-06-02

Department of Energy and Mines  
Petroleum Branch  
555 - 330 Graham Avenue  
Winnipeg, Manitoba

ATTENTION : Mr. L.R.Dubreuil  
Director, Petroleum Branch

**RE: Application For Reduced Spacing - South Pierson 09-16-002-29 W1M**


Home Oil Company Limited, as Operator of the South Pierson field request that the location at 09-16-002-29 W1M be granted a licence to drill. Under Board Order SU No.9, Home Oil is making an application to change the spacing to 16 ha for L.S.D.'s 16-16 and 09-16-002-29 W1M so that the location at 09-16 may be drilled.

Recent development drilling within the Unit area has increased our understanding of the complex geology of the South Pierson field. It is now known that oil bearing Mississippian extends further north into section 16 than previously thought. Logs from the unit well at 15-16 indicated limited Mississippian oil pay and post completion production has since confirmed the log response. Home Oil recently drilled and completed the well at 05-15-002-29 W1M. A similar log response as well as early production data suggests that the Mississippian is oil bearing in this area of the field as well. Home Oil has since attained a license to drill a step-out well at 12-15-002-29 W1M.

Although log and production response at 15-16 and 05-15 indicate Mississippian oil pay, the quality and quantity of pay is diminishing with the permeability and porosity pinching out to anhydrite. The net pay in the Lower Amaranth also decreases to the north and east of the Unit. Home Oil proposes to drill the well at 09-16 to further delineate the field. Depending on the log and production response of the well, a decision will be made to drill the other spacing unit at 16-16. A Tundra well at 04-22-002-29 W1M produces marginal volumes of oil and is not considered by us to be economical. A well at 09-14-002-29 W1M was also recently drilled by Cyn-Tech Ventures and is also considered to be a poor location. Home Oil believes that this proposal is a logical approach to delineating the field boundaries.

Please contact me at (403) 232-7370 or E.L.Doherty at (403) 232-7376 if you have any questions.

Yours truly,  
HOME OIL COMPANY LIMITED

  
\_\_\_\_\_  
G.C.K. Johnson, Co-ordinator  
Oil Division

GCKJ/ed

cc: G.C.K. Johnson  
E.L.Doherty  
D.W.White  
Pierson Corr

October 21, 1993

H. Clare Moster  
Deputy Chairman  
Oil and Natural Gas  
Conservation Board

John N. Fox  
Chief Petroleum Engineer  
Petroleum Branch

#### **HOME OIL APPLICATION AMENDMENT TO BOARD ORDER**

Home Oil Company Limited has applied to amend Board Order to provide for 16 ha spacing on a portion of the Pierson Lower Amaranth C Pool. Home Oil would like the 32 ha spacing unit comprised of LSD's 4 and 5 of Section 8-2-2-29 to be converted to two 16 ha spacing units. Home Oil has proposed to drill a well in LSD 5.

#### **Recommendations**

It is recommended that the application be approved. A proposed letter of approval from the Board is attached.

#### **Discussion**

Board Order SU 9 provides for special 32 ha spacing units in a portion of the Pierson Lower Amaranth C Pool (see Figure No. 1). The 32 ha spacing area excludes South Pierson Unit No. 1.

The Unit area is being drilled on 16 ha spacing as part of Home's waterflood project in the Pool.

The waterflood project area includes lands in the Pierson WMA. Under an agreement between Home Oil and Natural Resources, Home Oil is permitted to develop the WMA on 16 ha spacing provided drilling operations are restricted to certain times of the year.

Delineation and development drilling in 1993 have indicated that the downdip limit of the pool is likely to be near the 32 ha spacing unit (LSD 4 and 5 of Section 8-2-29). Home is concerned that the target location in the spacing unit (LSD 4) may be below the oil water contact. In the absence of a change in spacing, a well located in LSD 5 would be considered off target and would be subject to a severe off target penalty factor. Home has indicated that based on results of the well in LSD 5, it may drill LSD 4 next year.

Both LSD's 4 and 5 are directly offsetting south Pierson Unit No. 1. In addition, Home has plans to drill a well at 8-7-2-29 directly offsetting the proposed well at LSD 5. With drilling of the 8-7 well, all direct offsets to LSD 5 of

Section 8-2-29 would be productive (except LSD 4). As a result, correlative rights are not an issue.

Home has requested timely consideration of this application to permit drilling of the well prior to deer hunting season (Nov. 8) during which drilling operations are to be discontinued under the above mentioned agreement.



John N. Fox



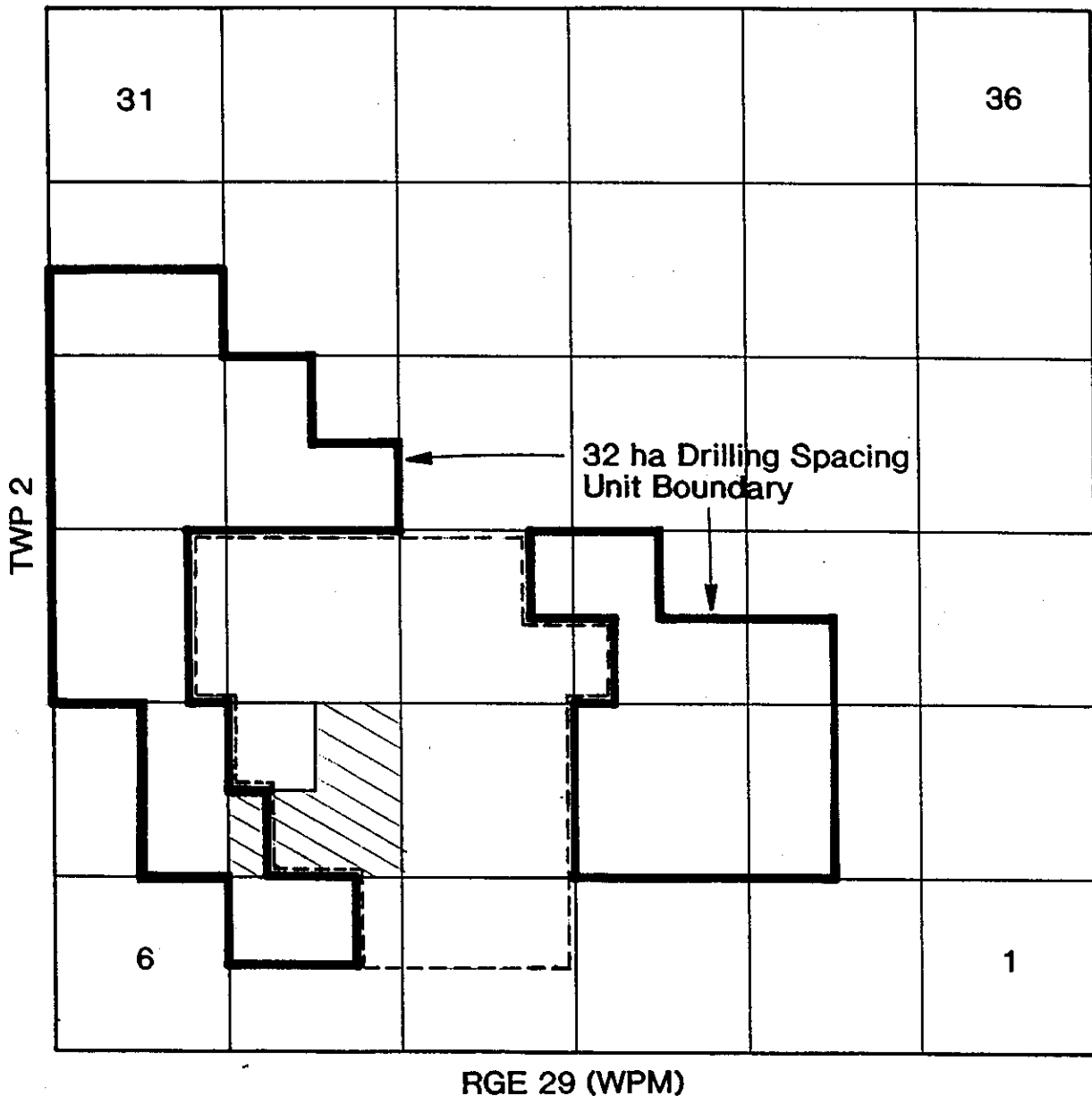
Recommended for approval:

---

L.R. Durbreuil  
Director of Petroleum

# BOARD ORDER NO. SU 9 SCHEDULE A - REVISED

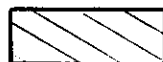
## PIERSON AREA 32 ha DRILLING SPACING UNITS LOWER AMARANTH AND MISSION CANYON FORMATIONS



S. Pierson Unit No. 1

-----

Wildlife Management area



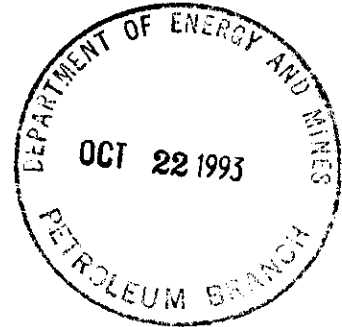
**Home Oil Company Limited**

1600 Home Oil Tower  
324 Eighth Avenue S.W.  
Calgary, Alberta T2P 2Z5  
Telephone (403) 232-7100  
Fax (403) 232-7678



1993-10-21

Department of Energy and Mines  
Petroleum Branch  
555 - 330 Graham Avenue  
Winnipeg, Manitoba  
R3C 0V8



ATTENTION: Mr. L.R.Dubreuil

**RE: Pierson Wildlife Management Area - 05-08-002-29 W1M Well Licence**

Home Oil Company Limited, as Operator of the South Pierson field request that the location at 05-08-002-29 W1M be granted a licence to drill. Under Board Order SU No.9, Home Oil is making an application to change the spacing to 16 ha for L.S.D.'s 04-08 and 05-08-002-29 W1M so that the location at 05-08 may be drilled.


The 05-08 location is part of a Wildlife Management Area which consist of the south half and northeast quarter section of section 08-002-29 W1M. In an agreement between the Department of Natural Resources and Home Oil, we are allowed to drill in this area only during certain times of the year, which for 1993 consists of the period between July 1 and November 8. Home Oil is also committed to developing as much of this area as possible before the end of the year.

Recently, company funds have become available to expand the amount to drilling that can be done in the Pierson area for this year. One of the areas of the Pierson field that has potential for delineation drilling is the southwest corner of section 08-002-29 W1M. Recent data from our drilling program and reservoir analysis indicates that of the two remaining locations (on 16 ha spacing) in this area, the location at 04-08 may possible be water bearing as it is structurally lower than the location at 05-08. We are forwarding you a copy of a letter recently sent to the Natural Resources Conservation office in Boissevain which outlines our intentions for this area's development. We have received verbal approval from the Wildlife Branch to proceed with the location at 05-08. Also the surrounding locations are owned and operated 100% by Home Oil, with the Unit area immediately to the east already drilled on 16 ha spacing unit's.

Since time is of the essence, we require approval on this issue immediately as we are prepared to move a drilling rig onto location on Saturday, October 23. As we still need to prepare a lease, approval will be required before Friday, October 22.

Please phone me at (403) 232-7370 or Eugene Doherty at (403) 232-7376 so that we may discuss this issue.

Yours truly,  
HOME OIL COMPANY LIMITED

  
G.C.K. Johnson, P.Eng  
Co-Ordinator, Southern District

attach;  
G.C.K.J./ed  
cc: G.C.K. Johnson  
E.L.Doherty  
Pier Corr



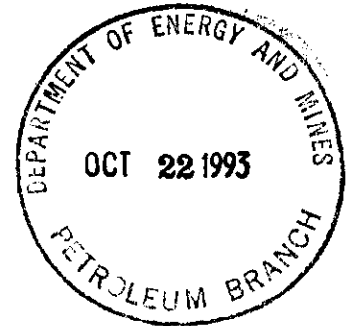
**Home Oil Company Limited**

1600 Home Oil Tower  
324 Eighth Avenue S.W.  
Calgary, Alberta T2P 2Z5  
Telephone (403) 232-7100  
Fax (403) 232-7678



1993-10-14

Manitoba Natural Resources  
Wildlife Branch  
P.O. Box 820  
Boissevain, Manitoba  
R0K 0E0



ATTENTION: T. Moran

**RE: Pierson Wildlife Management Area**

As discussed with you in a recent telephone conversation, Home Oil would like to drill another location in the WMA at 05-08-002-29 W1M. Only one location is being recommended at this time as the location at 04-08-002-29 W1M may be wet and uneconomic. Results from the 1993 Unit infill drilling program suggest that the southwest quarter of section 08-002-29 W1M is very near the oil/water contact in the spearfish formation. The location at 05-08-002-29 W1M is structurally higher than the 04-08 location and thus more likely to be oil bearing making it the preferred location to drill.

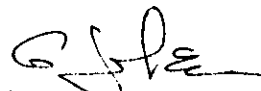
Home Oil proposes to drill and tie-in the 05-08 location this year just prior to or immediately following hunting season, after which the well will be evaluated as to whether the location at 04-08 will be drilled. If the location at 04-08 can be justified, then we would drill the well sometime next summer after July 1 and well before hunting season begins in the fall.

Cost to drill, equip and tie-in each location is approximately \$250,000. We would require approximately two weeks to drill, complete and equip the well. Given that we are prepared to accelerate our development of the WMA area by drilling one well this year and also that we would only require two weeks next year when we would be physically in the WMA; Home Oil feels that this is a reasonable compromise in developing the remaining well locations within the WMA. With the cost of \$250,000 to develop each location, Home Oil cannot justify more than one location at a time as the risk of finding water increases significantly with each new location in this area of the field.

Please phone me at (403) 232-7370 or Eugene Doherty at (403) 232-7376 so that we may discuss this issue.

Yours truly,

HOME OIL COMPANY LIMITED

  
G.C.K. Johnson, P.Eng  
Co-Ordinator, Southern District

G.C.K.J./ed  
cc: G.C.K. Johnson  
E.L. Doherty  
Pier Corr

PIERSON AREA  
32 ha DRILLING SPACING UNITS  
LOWER AMARANTH AND MISSION CANYON FORMATIONS



Twp 02

Pierse

SASKATCHEWAN

MANITOBA

T NICOLL } - SHELL -  
 S NICOLL }  
 MacLEOD }  
 → HOME OIL  
 SCURRY - RAINBOW  
 ALL SEC. 7

NW 1/4  
 C.B. RAINBOW (1/2)  
 C.B. RAINBOW (1/2)  
 → HOME

NE 1/4  
 D.H. BOND (1/4)  
 CAMDEN PARK  
 TRUST (1/4)  
 - SHELL - HOME  
 SCURRY - RAINBOW

N 1/2 • JOHN KIRKHAM  
 - HOME OIL

S 1/2 - PROV. CROWN -  
 HOME OIL  
 → SCURRY - RAINBOW

DOME (1/4) - FEE SIMPLE  
 HENRY KIRKHAM (1/4) → SHELL  
 HOME OIL  
 → SCURRY - RAINBOW S 1/2

NE 1/4  
 DORIS SMITH  
 - SHELL -  
 HOME OIL  
 SCURRY - RAINBOW

N 1/2 - PROV. CROWN  
 → HOME OIL  
 SCURRY - RAINBOW



The Oil and Natural Gas  
Conservation Board

555 — 330 Graham Avenue  
Winnipeg MB R3C 4E3  
CANADA

(204) 945-1111  
FAX: (204) 945-0586

October 22, 1993

Mr. G.C.K. Johnson  
Co-Ordinator, Southern District  
Home Oil Company Limited  
1600 Home Oil Tower  
324 Eighth Avenue SW  
Calgary, AB T2P 2Z5

Dear Mr. Johnson:

Re: Amendment to Board Order No. SU 9

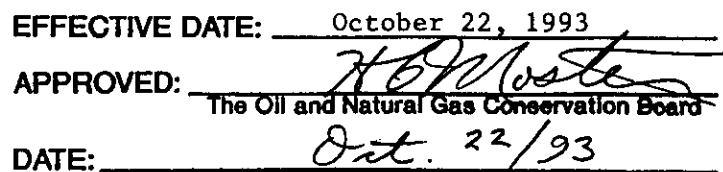
The Board has approved your application requesting modification of the 32 ha spacing area in the Pierson Field approved under Board Order No. SU 9. Attached is a revised Schedule A to the Board Order excluding Lsd's 4 & 5 in Section 8-2-29 (WPM) from the area of approval.

If you have any questions in respect of this matter please contact John N. Fox, Chief Petroleum Engineer at 945-6574.

Yours respectfully,

H. Clare Moster  
Deputy Chairman

PIERSON AREA  
32 ha DRILLING SPACING UNITS  
LOWER AMARANTH AND MISSION CANYON FORMATIONS





The Oil and Natural Gas  
Conservation Board

555 — 330 Graham Avenue  
Winnipeg MB R3C 4E3  
CANADA

(204) 945-1111  
FAX: (204) 945-0586

January 26, 1993

Mr. Jan Olthof, P.Eng.  
Manager, Southern Production  
Home Oil Company Limited  
1600 Home Oil Tower  
324 8th Avenue SW  
Calgary, AB T2P 2Z5

Dear Mr. Olthof:

**Re: Application for Continuation of 32 ha  
Spacing and Increased Maximum Permissible Production  
Rates in the Pierson Area**

The Board has completed its review of the subject applications. Attached is a copy of Board Order No. SU 9 approving 32 ha spacing for both the Lower Amaranth and Mission Canyon Formations in a portion of the area of application.

The Board has denied Home's application for continuation of increased maximum permissible production rates (MPPR's) in the Pierson area.

#### Continuation of 32 ha Spacing

In its preliminary review of reservoir characteristics and production performance the Board identified lands within the area of application where, in the Board's opinion, wells are not effectively draining 32 ha. Also identified were undrilled lands at or near the productive limits of the Pierson Lower Amaranth C, E and G Pools expected to have similar reservoir characteristics.

Home was requested by the Board (April 4, 1992) to comment on the continued applicability of 32 ha spacing for these lands. Home commented that reducing spacing would not likely lead to increased development and indicated it would provide a list of lands where 16 ha spacing was considered appropriate. Home submitted oh mapping and development drilling plans (January 8, 1993) in support of its request to continue 32 ha spacing on 2 1/2 sections proposed for exclusion from the Board's 32 ha spacing approval.

The Board has reviewed Home's submission and finds it difficult, based on Home's oh mapping, to include marginally productive or non-developed lands in the 32 ha spacing approval at this time. However, in recognition of Home's 1993 winter drilling plans, the Board has decided to include the SW/4 of Section 4 and the SE/4 of Section 7 in Township 2, Range 29(WPM) in Board Order No. SU 9.

Effective the date of this order, spacing for the lands not included in Board Order No. SU9 reverts back to 16 ha. Board Order No. SU 9 includes a provision allowing the Board to modify the area approved under the order from time to time to accommodate additional lands proved up by development drilling and to allow reduced spacing within the waterflood project area.

#### Denial of Continuation of Increased MPPR's

In August 1992, there were no wells in the Pierson Lower Amaranth C, E, and G Pools capable of producing at the original MPPR of 9.5 m<sup>3</sup>/d and 240 m<sup>3</sup>/month. In Home's response to the Board's deficiency letter (April 10, 1992), the company indicated increased MPPR's were needed to recover post-stimulation flush zone production from newly drilled wells, as such production can significantly enhance development drilling economics. Subsection 51(5) of The Petroleum Drilling and Production Regulation ('the regulation') was introduced in 1990 to permit a well to accumulate without penalty, 500 m<sup>3</sup> of over-production during the first six months the well produces. This over-production allowance effectively increases the MPPR during the first six months a well produces from 240 m<sup>3</sup>/month to 320 m<sup>3</sup>/month.

In its preliminary waterflood study Home indicated that reservoir depletion in the Pierson Lower Amaranth C Pool is a concern. Home indicated some wells are already producing above the solution GOR and the company anticipates average reservoir pressure in the pool will decline below the bubble point in one to three years.

The Board believes reservoir depletion and the potential negative impact on ultimate recovery if implementation of pressure maintenance is delayed, is a major concern in the Pierson Lower Amaranth C Pool. Continuation of increased MPPR's may increase reservoir withdrawals and accelerate reservoir depletion. For these reasons, Home's application for continuation of increased MPPR's for the Pierson Lower Amaranth C, E, and G Pools is denied. Effective February 1, 1993, the MPPR for these pools will be as set out in Schedule D of the regulation; 9.5 m<sup>3</sup>/day and 240 m<sup>3</sup>/month. When a pressure maintenance scheme is implemented MPPR restrictions may, on application and in the absence of equity or conservation concerns, be waived within the waterflood project area.

Other Matters

Home Oil is requested to keep the Petroleum Branch informed of the status of the following matters;

- (1) unit negotiations,
- (2) preparation of a pressure maintenance application,
- (3) 1993 pressure survey plans, and
- (4) the Mission Canyon geological and reservoir study.

If you have any questions in respect to these matters, please contact L.R. Dubreuil, Director of Petroleum or John N. Fox, Chief Petroleum Engineer at 945-6573 or 945-6574, respectively.

Yours respectfully,

A handwritten signature in black ink, appearing to read 'H. Clare Moster', with a stylized, flowing script.

H. Clare Moster  
Deputy Chairman

Attachments.





The Oil and Natural Gas  
Conservation Board

555 — 330 Graham Avenue  
Winnipeg MB R3C 4E3  
CANADA

(204) 945-1111  
FAX: (204) 945-0586

January 26, 1993

Mr. Doug Southam  
Box 243  
Melita, MB R3B 0X3

Dear Mr. Southam:

**Re: Home Oil's Application for Continuation of 32 ha  
Spacing in the Pierson Area**

The Board has completed its review of Home's and Tundra's applications for continuation of 32 ha spacing for the Lower Amaranth Formation in the Pierson area. Home has also requested that 32 ha spacing be extended to include the Mission Canyon Formation. Attached is a copy of Board Order No. SU 9 approving 32 ha spacing for both the Lower Amaranth and Mission Canyon Formations in a portion of the area of application.

In its review of reservoir characteristics and production performance the Board has determined that wells in the better quality portions of the Pierson Lower Amaranth C Pool are capable of effectively draining 32 ha. However, wells at or near the productive limits of the Lower Amaranth Formation are not capable of draining 32 ha. Effective on the date of Board Order No. SU 9, spacing for these lands reverts back to 16 ha.

As you are aware from Home's letter dated May 15, 1992 the company has tentative plans to implement a waterflood in a portion of the Pierson Lower Amaranth C Pool in 1993. Home is planning to conduct waterflooding on 16 ha spacing by drilling infill wells and converting the existing wells to water injection. Waterflooding has been successful in the Lower Amaranth Formation in the Waskada Field and is expected to significantly increase oil recovery in the Pierson Field.

If you have any questions in respect to this matter, please contact L.R. Dubreuil, Director of Petroleum or John N. Fox, Chief Petroleum Engineer at 945-6573 or 945-6574, respectively.

Yours respectfully,

A handwritten signature in black ink, appearing to read "H. Clare Moster". The signature is fluid and cursive, with a large, sweeping flourish at the end.

H. Clare Moster  
Deputy Chairman

Attachments.



The Oil and Natural Gas  
Conservation Board

555 — 330 Graham Avenue  
Winnipeg MB R3C 4E3  
CANADA

(204) 945-1111  
FAX: (204) 945-0586

January 26, 1993

Mr. Robert G. Puchniak  
President  
Tundra Oil and Gas Ltd.  
1313 One Lombard Place  
Winnipeg, MB R3B 0X3

Dear Mr. Puchniak:

**Re: Application for Continuation of 32 ha  
Spacing in the Pierson Area**

The Board has completed its review of Tundra's and Home Oil's applications for continuation of 32 ha spacing for the Lower Amaranth Formation in the Pierson area. Attached is a copy of Board Order No. SU 9 approving 32 ha spacing for both the Lower Amaranth and Mission Canyon Formations in a portion of the area of application.

In its preliminary review of reservoir characteristics and production performance the Board identified Tundra's wells in Section 22-2-29 (WPM) as being incapable of effectively draining 32 ha. Section 23-2-29 (WPM), while undrilled, is expected to have similar reservoir characteristics. Tundra was requested by the Board (June 2, 1992) to comment on the continued applicability of 32 ha spacing for these lands. No reply to the Board's letter was received. The Board has concluded that 32 ha spacing will not maximize recovery in Sections 22 & 23-2-29 (WPM) and may unnecessarily restrict development of these lands. Therefore Tundra's lands in Sections 22 & 23-2-29 (WPM) are not included in Board Order No. SU 9 and effective the date of this order, spacing for these lands reverts back to 16 ha.

If you have any questions in respect to this matter, please contact L.R. Dubreuil, Director of Petroleum or John N. Fox, Chief Petroleum Engineer at 945-6573 or 945-6574, respectively.

Yours respectfully,

H. Clare Moster  
Deputy Chairman

Attachments.



The Oil and Natural Gas  
Conservation Board

555 — 330 Graham Avenue  
Winnipeg MB R3C 4E3  
CANADA

(204) 945-1111  
FAX: (204) 945-0586

## Order No. SU 9

An Order Pertaining to Drilling Spacing Units  
Pierson Area  
Lower Amaranth and Mission Canyon Formations

WHEREAS, clause (9)(b) of section 62 of "The Mines Act", being Chapter M160 of the Continuing Consolidation of the Statutes of Manitoba, provides as follows:

"62(9) Without restricting the generality of subsection (8) the board, with the approval of the minister, may make orders

(b) respecting the designation of the area that shall be allocated to a well in connection with fixing allowable production;"

AND WHEREAS, clause (1)(f) of section 63 of "The Mines Act" provides in part as follows:

"63(1) For the purpose of carrying out the provisions of this Part and Part III according to their intent, the Lieutenant Governor in Council may make such regulations and orders as are ancillary thereto, and are not inconsistent therewith; and every such regulation or order made under, and in accordance with the authority granted by, this section has the force of law; and, without restricting the generality of the foregoing, the Lieutenant Governor in Council may make regulations and orders

(f) prescribing spacing units and the size and shape of spacing units;"

AND WHEREAS, subsection (1) of section 20 of Manitoba Regulation 430/87R under The Mines Act ("the Petroleum Drilling and Production Regulation") provides as follows:

"20(1) Notwithstanding section 19, the board may, after a public hearing or after publication of notice, prescribe by order special drilling spacing units which may differ from normal drilling spacing units in size, shape or target area."

AND WHEREAS, subsection (3) of section 21 of the Petroleum Drilling and Production Regulation provides as follows:

"21(3) Where a special drilling spacing unit is prescribed under section 20, the board may prescribe the target area within which a well shall be completed in order to qualify for a maximum permissible production rate based on the area of the special drilling spacing unit."

AND WHEREAS, the Board received an application dated September 26, 1991 from Home Oil Company Limited and an application dated October 1, 1991 from Tundra Oil and Gas Ltd. for continuation of special 32 ha drilling spacing units for the Lower Amaranth Formation in the Pierson area ("the area of application"). Home Oil Company Limited also applied for approval of special 32 ha drilling spacing units for the Mission Canyon Formation.

AND WHEREAS, upon publication of notice of the application, the Board received an objection to the application.

AND WHEREAS, upon due consideration of the said applications and objection thereto, the Board considers continuation of special 32 ha drilling spacing units for the Lower Amaranth Formation and establishment of special 32 ha drilling spacing units for the Mission Canyon Formation in a portion of the area of application to be reasonable and desirable.

NOW THEREFORE, the Board orders that:

1. The spacing unit for each well drilled, or to be drilled, for the purpose of obtaining oil from the Jurassic Lower Amaranth Formation or the Mississippian Mission Canyon Formation within the area outlined on Schedule A is two legal subdivisions comprising the east half or the west half of a quarter section.
2. The target area of each drilling spacing unit shall be a square area in the even-numbered legal subdivision having sides one hundred metres from the sides of the legal subdivision and parallel to them.

3. The area outlined on Schedule A may be modified by the Board from time to time to meet changing circumstances.
4. Board Order No. SU 6 dated July 27, 1990 is hereby rescinded.



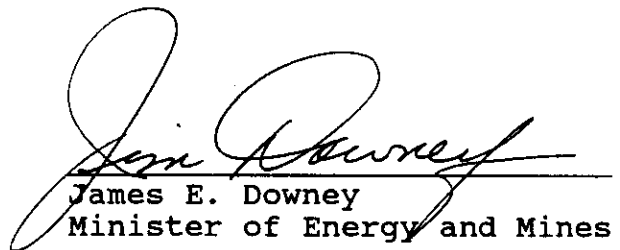
H. Clare Moster  
Deputy Chairman



David Tomasson  
Chairman

OIL AND NATURAL GAS  
CONSERVATION BOARD ORDER  
NO. SU 9 APPROVED THIS  
**25<sup>TH</sup>** DAY OF **JANUARY** A.D., 1993  
AT THE CITY OF WINNIPEG.

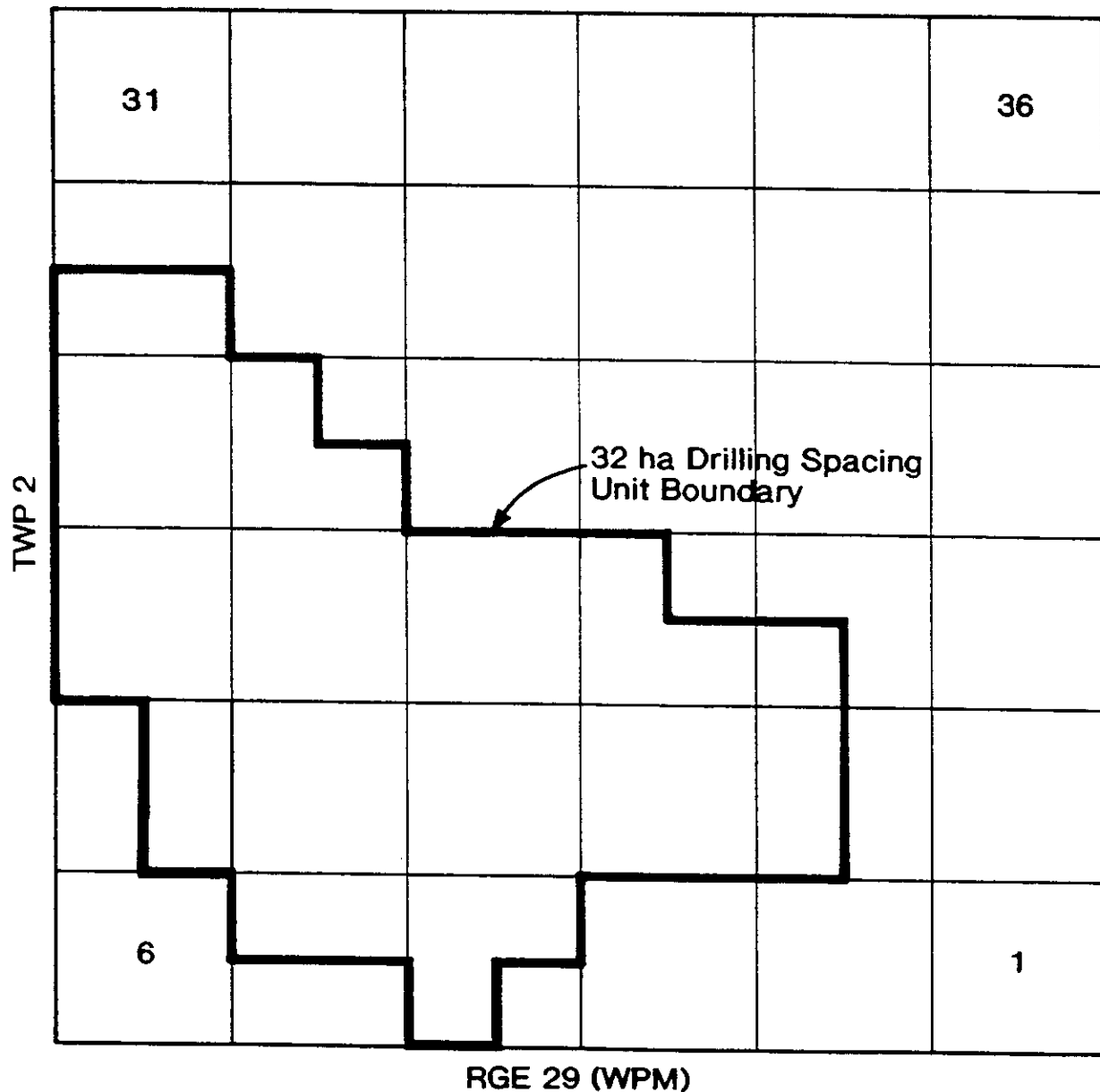
APPROVED:



James E. Downey  
Minister of Energy and Mines

**BOARD ORDER NO. SU 9  
SCHEDULE A**

**PIERSON AREA  
32 ha DRILLING SPACING UNITS  
LOWER AMARANTH AND MISSION CANYON FORMATIONS**



# Action/Route Slip

**Date:** January 14, 1993

**To:** Clare Moster

**From:** Bob Dubreuil

**Re:** Pierson Area - Application for Spacing and MPPR Increase

---

**Comments:**

Attached are the long awaited recommendations of the Branch regarding applications for special spacing and MPR exemption in the Pierson Field submitted by Home and Tundra in the fall of '91.

You should have copies of the original applications and the related correspondence in your files, but please advise if you require additional information.

Perhaps you can take advantage of your sojourn with Mr. Tomasson and Mr. Downey to get their names on the appropriate dotted lines.

The objection of Mr. Southam (royalty owner of the S 1/2 of Section 17-2-29 in the area proposed for continuation of 32 ha spacing) is attached. His concerns/suggestions have not been technically justified, and should be largely addressed by Home's plans to implement a water-flood over the next few years. Home and Mr. Southam have had ongoing discussions since the intervention was submitted.

I have also included for your information the material received from Home last week in response to our proposed 32 ha spacing area.

January 20, 1993  
H. Clare Moster

**The Oil and Natural Gas Conservation Board**

**Home Oil's Applications  
(Pierson Area)**

Well Spacing:

- 32 ha spacing original approved for a small area under Order SU5 (October 4/89) for an interim period of 2 years ending October 31/91.
- Order SU6 (July 27/90) enlarged size of area but continued October 31/91 expiry.
- Home applied in October, 1991 to continue the 32 ha spacing and also apply it to the Mission Canyon formation (currently only the Lower Amaranth).
- Notice of application was published in October 10/91.
- Because Department not satisfied with technical support, and Home indicated further detailed technical studies were being done which would help support this application, the Board agreed to extend the approval under SU6 until such time as a decision was made on current application (i.e., awaiting further technical evidence and development plans from Home).

Home's Justification for Continued 32 ha:

- 32 ha will adequately drain reservoirs (i.e., no loss in ultimate recovery)
- 16 ha spacing will not result in significant additional recovery and therefore is uneconomical
- plans to drill on 16 ha spacing for waterflood project area
- L.A. and MC formations in communication, therefore should have same spacing configuration
- Home agrees that wells not in the central WF area will not drain 32 ha
- Home, when asked to comment on reducing the size of the area allowing 32 ha spacing, agreed with most of the Departments reduction proposal (5 1/2 of 8 sections, or 69%).

Department Staff Recommendation:

- Reduce size by 7 1/2 sections, i.e., agreed in



inclusion of an additional 1/2 section (2-1/4's), of the 2 1/2 additional sections Home wanted added

Result: Total of 2 sections that Home wants, are not recommended by Department

- Reasons:

- eliminated areas are in undrilled peripheral areas of pool, with no proven reservoir quality to justify 32 ha spacing (evidence would suggest 16 ha required)
- eliminated areas are primarily outside of Home's planned Waterflood area (see Fig. 4), except for N1/2 30 & SW 31
- no evidence in excluded areas to justify why spacing should not be provincial standard (16 ha, or per regulations)
- mineral rights owners could have concern that Government not properly ensuring their mineral rights are being properly developed to maximize recovery (e.g., Doug Southam's initial objection)
- does not preclude Home from initially drilling/developing lands on 32 ha, and based on results either fully developing on 16 ha or applying to Board to include area under 32 ha spacing if technical evidence supports

Notes: Proposed Board Order SU9 (Condition 3) specifically allows for this to occur.

- Department recommends identical spacing for MC formation in areas covered by 32 ha spacing order (communication)

Other Concerns:

- Tundra had requested continued 32 ha spacing for their lands in Sections 22 & 23 but have indicated that their current economics do not support drilling on either 32 or 16 ha.
- Doug Southam, mineral owner on Section <sup>S1/2</sup> 17 objected to 32 ha spacing unless Home had development plan to drill and waterflood (Home's plan addresses this).

Increased MPPR Application:

- standard MPPR are 9.5 m<sup>3</sup>/d and 240 m<sup>3</sup>/mth
- Home applied in 1990 for increased MPPR to coincide with increased 32 ha spacing
- Board approved increased MPPR of 14 m<sup>3</sup>/d and 360 m<sup>3</sup>/mth

under Order 80A (July/90) for term of SU6 and for wells in SU6

- Home applied in October/91 to continue increased MPPR for wells in 32 ha area and also for MC wells in same area
- Reason:
  - allows wells capable of more than standard allowable to produce at higher rates which improves economics of well (play)

Department's Staff Recommendation:

- review of production capabilities of wells drilled to date indicate only small percentage ever capable of more than standard allowable, particularly after first few months of flush production
- MPPR Regulation change made in 1990 allows for 500 m<sup>3</sup> of overproduction during well's first 6 months. This effectively increases a new well's MPPR to 320 m<sup>3</sup>/mth for first 6 months of production.
- Reservoir pressures at some wells in pool already exhibiting pressures at or near bubble point, with associated solution gas breakout and increasing GOR's which could negatively affect ultimate reserve recovery.
- Home has also indicated concern over reservoir depletion in waterflood Phase I area of pool. *- justification of 16-8 pilot injectivity test*
- therefore, allowing higher than normal production rates would only encourage greater production and aggravate depletion concern *and would provide only minimal extra production*
- MPPR's not intended as mechanism to maximum flush production
- MPPRs for wells in active pressure maintenance projects (e.g., waterfloods) are commonly exempted, on application, by the Board
- MPR exemption under waterflood is an added incentive for company to implement a waterflood project in a timely manner.



## Memorandum

Date January 20, 1993

To David Tomasson  
Chairman  
The Oil and Natural Gas  
Conservation Board

From H. Clare Moster  
*Deputy* Co-Chairman  
The Oil and Natural Gas  
Conservation Board

Subject **HOME OIL APPLICATIONS - PIERSON FIELD**  
**WELL SPACING AND MAXIMUM PERMISSIBLE PRODUCTION RATES**

As briefly discussed with you, attached and recommended for your signature and the Minister's approval is Board Order No. SU9.

Also attached is a copy of the Petroleum Branch's memo to the Board describing the applications, their analysis, and their recommendations to the Board.

I have also included a copy of my rough notes on the two applications.

Also attached are copies of the proposed Board letters I plan to send to the other involved parties advising of the Board's decision on the two applications.

In summary, the recommended decisions are:

1. Well Spacing

To approve Home's application for continued 32 ha well spacing for a portion (11.5 sections of 13.5 sections, or 85%) of the area ultimately requested by Home and to include both the Lower Amaranth and the Mission Canyon Formations under the Order, as requested by Home.

The two sections not included are located on the periphery of the currently developed pool and appear to be in areas where reservoir quality will require 16 ha spacing to achieve adequate drainage. The excluded areas are also not within Home's planned multi-year Phase I - IV waterflood project area.

The Board Order has been so worded to enable the Board to readily allow expansion of the approved area if future developments (e.g., well drilling) supports 32 ha spacing in the excluded areas.

2. Maximum Permissible Production Rates (MPPR)

To deny Home's application to continue the current temporarily increased MPPRs for wells producing from the Lower Amaranth or Mission Canyon Formations in the 32 ha spacing area.

First | Fold

The main reasons being:

- Evidence in the form of reduced reservoir pressures and increasing production gas/oil ratios indicate that certain areas are already experiencing accelerated reservoir depletion.
- Increased MPPRs will only accelerate reservoir depletion and possible result in reduced ultimate recovery from the reservoir, in the absence of pressure maintenance (i.e. waterflooding).
- Revisions made to the MPPR regulation in 1990 provide for increased production allowables during the first 6 months of a new well's production, which is normally when a typical well's production capacity might exceed the standard allowable.
- Few wells in the pool have production capacities exceeding the standard production allowable.
- Normal practise to exempt wells in active pressure maintenance projects from MPPR restrictions may encourage Home to implement their waterflood plans in a more expeditious manner.

Please return both copies of the Order to me when signed and approved.



H. Clare Moster  
HCM/ms

Attachments

HOMEMEMO.DOC  
JAN/93



## Memorandum

Date January 13, 1993

To The Oil and Natural Gas  
Conservation Board

From John N. Fox  
Chief Petroleum Engineer  
Petroleum Branch

-David Tomasson, Chairman  
-H. Clare Moster, Deputy Chairman

Telephone

Subject **PIERSON AREA - APPLICATION FOR 32 ha  
SPACING AND MPPR INCREASE**

In October 1991, Home Oil Company Limited and Tundra Oil and Gas Ltd. filed applications to continue 32 ha spacing for the Lower Amaranth Formation in the Pierson area as approved under Board Order No. SU 6. Home requested 32 ha spacing be extended to include the Mission Canyon Formation. Home also applied for extension of increased MPPR's for wells producing from the Lower Amaranth Formation as approved under Board Order No. 80A.

Upon receipt of the applications, the Board notified both Home and Tundra that Board Order No.'s SU 6 and 80A would be extended pending final disposition of the applications. It was subsequently decided to delay disposition of the applications pending submission by Home of a reservoir/waterflood feasibility study expected to be completed in December 1991. Home's preliminary waterflood study was received in May 1992 (the study results were outlined in the Branch's memo to the Board, May 29, 1992). At that time, Home planned to submit an application for approval of a pilot waterflood/injectivity test. A decision was made to further delay disposition of the subject applications until the pilot waterflood/injectivity test application was disposed of. The Board approved Home's injectivity test September 29, 1992.

### Recommendations

It is recommended that the Board approve continuation of 32 ha spacing in a portion of the area of application. Proposed Board Order No. SU 9 approves 32 ha spacing in an area excluding

- (a) Crown lands where leases (formerly held by Home or Tundra) have expired,
- (b) developed lands where wells are not capable of draining 32 ha, and
- (c) undeveloped lands at or near the productive limits of the Lower Amaranth Formation.

Proposed Board Order No. SU 9 also extends 32 ha spacing to the Mission Canyon and includes provisions allowing the Board to modify the area approved under the order from time to time.

First | Fold

It is recommended that Home's application for continuation of increased MPPR's be denied. With the exception of flush production from new wells, Lower Amaranth productivity is less than the original MPPR of 9.5 m<sup>3</sup>/d and 240 m<sup>3</sup>/month. In addition there is a concern that any increased reservoir withdrawals will accelerate depletion in a reservoir already experiencing solution gas breakout.

Proposed Board letters to Home, Tundra and D. Southam, a mineral owner who objected to continuation of 32 ha spacing, are attached.

## Discussion

### **Application for 32 ha Spacing**

Figure 1 shows the area of application for continuation of 32 ha spacing in the Pierson area. Also, highlighted are Home's and Tundra's lands and the area approved under Board Order No. SU 6. For the purpose of determining appropriate spacing the area of application has been divided into a waterflood and non-waterflood area. Figure 1 shows the proposed areas as determined by the Branch based on information submitted by the applicants, particularly Home.

#### 1. Waterflood Area

Home plans to implement the first phase of its waterflood in the central portion of the Pierson Lower Amaranth C Pool. Home's waterflood implementation schedule is shown in Figure 2. In the 2nd Qu/93, after unitization is complete, the company plans to drill 16 ha infill wells and convert existing producers to injectors. Figure 3 shows Home's preliminary unit area and 1993 drilling locations and injector conversions. With the exception of 5 locations, 3 of which are planned to be drilled in 1993, the area is completely developed on 32 ha spacing.

Home has tentative plans to expand the waterflood over a 6 year period. Figure 4 shows Home's proposed waterflood expansion plans;

Phase II	Section 19, 20 & S/2 of 30
Phase III	Section 7 & 18
Phase IV	Section 10, 11, 14 & 15

Considerable development drilling is required in Phases II - IV as none of the lands are fully developed on 32 ha spacing.

Production data, estimated primary recovery, pressure information and log data has been reviewed by the Branch to determine the continued appropriateness of 32 ha spacing under primary recovery in the waterflood area.

Home has divided the Lower Amaranth into 3 correlatable reservoir units; the A, B, & C Sands (Figure 5). The main reservoir is contained within the thicker, more permeable C Sand. Log data and recent RFT pressures from the new wells at 6-8, 10-8, 2-9, 6-9, and 10-9 within the waterflood Phase I area confirm the continuity of the B and C Sands.

RFT pressures (Figure 6) ranged from 7660 - 8770 kPa, 1730 - 2840 kPa less than original reservoir pressure. It is apparent from the RFT pressure data that in the better quality portions of the reservoir, wells are capable of draining at least 32 ha.

Individual well estimated primary recoveries (Figure 7) vary substantially within the waterflood area. The variations in recovery can be attributed to a number of factors; reservoir quality, completion practices, Mission Canyon communication and length of time on production. There are numerous wells throughout the waterflood area that are predicted to recover in excess of 10% OOIP on 32 ha spacing under primary production. If 16 ha drainage is assumed, primary recovery from these wells would be unrealistically high, over 20% OOIP. Therefore, it is reasonable to assume within the waterflood area, that in general, wells are adequately draining 32 ha.

Home still maintains in the better quality portions of the reservoir, infill drilling on 16 ha spacing will not result in substantial incremental recovery under primary production and is therefore uneconomic. There is presently no technical evidence to refute this claim.

It is proposed to continue 32 ha spacing under primary recovery in the waterflood area. This will ensure 16 ha infill drilling does not occur prematurely, accelerating depletion and perhaps unnecessarily delaying or complicating unit negotiations. Reduced spacing under secondary recovery can be reviewed by the Board in conjunction with approval of the waterflood.

## 2. Non-Waterflood Area

The non-waterflood area (Figure 8) includes both Tundra and Home lands at or near the productive limits of the Pierson Lower Amaranth C Pool and all lands within the Pierson Lower Amaranth E and G Pools.

The criteria used by the Branch for the preliminary screening of lands as waterflood versus non-waterflood was done on a 1/4 section basis. For a 1/4 section to be considered to have waterflood potential it must contain a well capable of recovering 5000 m<sup>3</sup> of oil on primary. Current productivity, cumulative production to date and decline rate were used to evaluate individual well primary recovery (Figure 7 & 8). If a 1/4 section was laterally adjoined by two 1/4 sections meeting the criteria, the 1/4 section was considered to have waterflood potential.

Both Home and Tundra have acknowledged that wells in the non-waterflood area are not capable of adequately draining 32 ha and that infill drilling on 16 ha spacing will result in incremental recovery.

Tundra in its application indicated development drilling in Section 22-2-29 was uneconomic on both 16 ha and 32 ha spacing at present oil prices (\$132.15/m<sup>3</sup>). Home Oil's economics for 16 ha development drilling at or near the productive limits of the Lower Amaranth are marginal. A summary of the companies' economics are shown in Table 1.

It is proposed that spacing in the non-waterflood area be reduced to 16 ha. The main reason for recommending reduced 16 ha spacing is technical evidence and admission by the applicants that wells at or near the productive limits of the Lower Amaranth do not adequately drain 32 ha.

The companies, especially Home may argue that some of the lands have waterflood potential. However, both companies have been given an opportunity by the Board to comment on the exclusion of non-waterflood lands from the 32 ha spacing approval. Tundra did not reply to the Board's deficiency letter dated June 2, 1992. Home commented that reducing spacing would not likely lead to increased development and indicated it would provide a list of lands where 16 ha spacing would be appropriate. Home has not provided the list of lands. Actions such as lease expires, lease extensions, and offset calls within the non-waterflood area suggest that both companies view these lands as having limited potential. If subsequent development drilling indicates wells in parts of the non-waterflood area are capable of draining 32 ha, the companies may re-apply for increased spacing.

Home was informally advised by the Branch (November 30, 1992) of the lands proposed for exclusion from the 32 ha spacing approval. The company responded by requesting the lands highlighted in Figure 9 be included in the Board's approval. Home's reasons for including the lands is based on its  $\phi h$  mapping (Figure 10) and 1993 development drilling plans (Figure 3). It is difficult to include/exclude lands from 32 ha spacing based primarily on  $\phi h$  mapping. For example, the most productive part of the Pierson Lower Amaranth C Pool has a  $\phi h$  of less than 0.5  $\phi.m$ , while along the productive limits of the pool the  $\phi h$  is greater than 0.75  $\phi.m$ .

The Branch has reviewed Home's request and is prepared to recommend inclusion of the SW/4 of Section 4 and the SE/4 of Section 7 in the 32 ha spacing approval.



### 3. Mission Canyon Depletion Strategy

There is evidence in both the Waskada and Pierson Fields that the Lower Amaranth and Mission Canyon are in communication through natural and induced fractures. Home's preliminary waterflood study attempted to quantify the contribution of Mission Canyon reserves to overall recovery in the Pierson area. Home estimates Mission Canyon reserves account for 2.0% of its Pierson area production. Home is presently evaluating the Mission Canyon in detail to identify oil-in-place and to develop a strategy to maximize combined recovery from the Lower Amaranth and Mission Canyon. Home should be requested to submit the results of its Mission Canyon reservoir study, when completed.

Home also provided information that shows stand alone Mission Canyon development drilling is uneconomic (Table 1).

It is proposed that Mission Canyon spacing mirror the spacing approved for the Lower Amaranth. Identical spacing reflects the fact that the formations are in communication and are being concurrently depleted.

### 4. Board Order No. SU 9

A copy of Board Order No. SU 9 approving 32 ha spacing for the Lower Amaranth and Mission Canyon Formations in the waterflood area as shown in Figure 1 is attached. The order rescinds Board Order No. SU 6. To accommodate both development drilling proving up additional lands with waterflood potential and reduced spacing within the waterflood project area, the order includes a provision to allow the Board to modify the area approved under the order from time to time.

There is still an outstanding objection to Home's 32 ha spacing application. The mineral owner in the S/2 of Section 17-2-29 (WPM) is concerned that 32 ha spacing will not maximize recovery. A proposed letter advising Mr. D. Southam of the Board's decision is attached.

### **Application for Increased MPPR's**

Board Order No. 80A approved an MPPR increase from 9.5 m<sup>3</sup>/day and 240 m<sup>3</sup>/month to 14 m<sup>3</sup>/day and 360 m<sup>3</sup>/month for wells producing from the Lower Amaranth in an area coincident with the 32 ha spacing area approved under Board Order No. SU 6.

In July 1992, Home did not have a single well in the Pierson Lower Amaranth C, E, and G Pools capable of producing at the original MPPR (Figure 8). In Home's response to the Board's deficiency letter (April 10, 1992), the company indicated increased MPPR's were needed to recover post-stimulation flush production from newly drilled wells, as such production can significantly enhance development drilling economics. Initial

production data from Home's six recently drilled wells ( on production in October 1992 ) indicate 2 or 3 wells are capable of producing at rates in excess of 240 m<sup>3</sup>/month (Table 2). However, production data for December 1992 (Table 2) indicates only the 6-9-2-29 well is capable of producing more than the original MPPR of 240 m<sup>3</sup>/month.

In its preliminary waterflood study, Home indicated that reservoir depletion especially in the waterflood Phase I area is a concern. As a result of pressure near the wellbore dropping below the bubble point (4550 kPa), some wells are already exhibiting solution gas break-out in the reservoir and excess gas production. Individual well GOR's, plotted in Figure 11, show a wide variation, with a number of wells producing above the solution GOR of 53.7 m<sup>3</sup>/m<sup>3</sup>. Home anticipates average reservoir pressure in the Pierson Lower Amaranth C Pool will decline below the bubble point in one to three years.

The Branch believes reservoir depletion and the potential negative impact on ultimate recovery, if implementation of pressure maintenance is delayed, is a major concern in the Pierson Lower Amaranth C Pool. Continuation of increased MPPR's will increase reservoir withdrawals and accelerate reservoir depletion. The Branch also feels MPPR's were not intended to provide a mechanism for maximizing flush production from new wells.

For these reasons, it is recommended that continuation of increased MPPR's for the Pierson Lower Amaranth C, E, and G Pools be denied. Effective February 1, 1993, the MPPR for these pools will be as set out in Schedule D of the regulations; 9.5m<sup>3</sup>/day and 240 m<sup>3</sup>/month.

The impact of denying continuation of increased MPPR's should be minimal. Subsection 51(5) of the regulations was introduced in 1990 to permit a well to accumulate without penalty, 500 m<sup>3</sup> of over-production during the first six months the well produces. This over-production allowance effectively increases the MPPR during the first six months a well produces from 240 m<sup>3</sup>/month to 320 m<sup>3</sup>/month. Assuming Home's new wells continue to decline at present rates, and MPPR restrictions are waived when the waterflood is implemented, discontinuing increased MPPR's will result in Home's Pierson production being restricted by only 40-50 m<sup>3</sup>/month (1.5% of total production) for 6 - 9 months.

ORIGINAL SIGNED BY  
JOHN N. FOX

John N. Fox

Original Signed By  
L. R. DUBREUIL

Recommended for Approval: \_\_\_\_\_  
L.R. Dubreuil

**TABLE 1**  
**PIERSON AREA - DRILLING ECONOMICS**

	Tundra		Home Oil	
	16 ha	32 ha	16 ha	Mission Canyon
Initial Production (m <sup>3</sup> /d)	2.9	2.9	2.5	1.5
Recoverable Reserves (m <sup>3</sup> )	3221.0	4916.0	5000.0	----
NPV (AIT) (\$000)	-44*	2.4*	2.9**	-34.7***
ROR (AIT) (%)	7.9	15.0	12.4	11.7
PAYOUT (YRS)	---	---	4.4	7.3

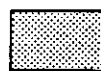
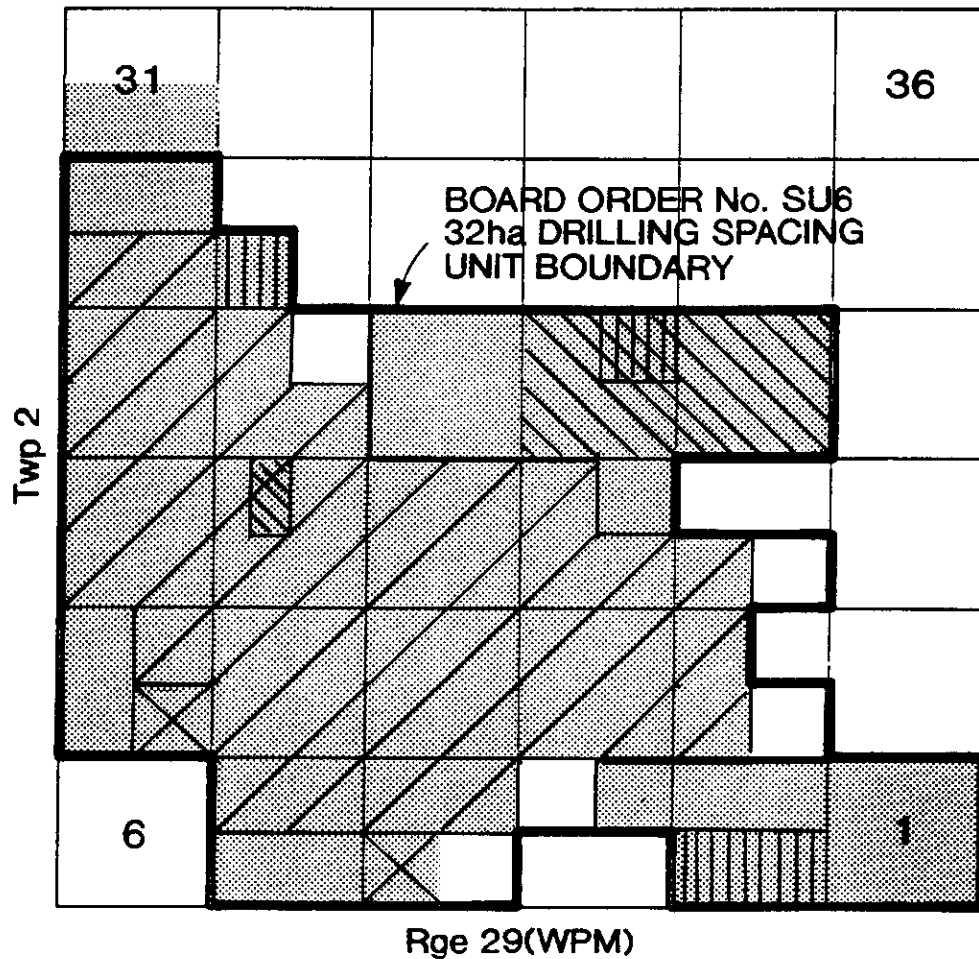
Oil Price - 132.15/m<sup>3</sup>

\* DCF = 20%  
 \*\* DCF = 12%  
 \*\*\* DCF = 15%

**TABLE 2****INITIAL PRODUCTIVITY - HOME'S NEW WELLS**

<b>WELL</b>	<b>INITIAL PRODUCTIVITY October 1992</b>		<b>PRODUCTIVITY December 1992</b>	
	<b>(m<sup>3</sup>/day)</b>	<b>(m<sup>3</sup>/mth)</b>	<b>(m<sup>3</sup>/day)</b>	<b>(m<sup>3</sup>/mth)</b>
10-8-2-29	11.7	355.0	6.4	101.8
14-8-2-29	6.5	197.0	3.9	120.3
2-9-2-29	7.6	231.0	5.2	153.4
6-9-2-29	20.5	623.0	10.4	321.9
10-9-2-29	8.3	252.0	6.8	202.2

FIGURE NO. 1



AREA OF APPLICATION



TUNDRA'S LANDS, REMAINDER OF  
LANDS ARE HOME'S



CROWN LEASE EXPIRIES SINCE OCT/91



WATERFLOOD AREA { NON-WATERFLOOD AREA - REMAINDER  
OF LANDS WITHIN AREA OF APPLICATION }



AREA ADDED TO THE WATERFLOOD AREA  
BASED ON HOME'S SUBMISSION ( JAN 8/93 )

# **SOUTH PIERSON - DEVELOPMENT SCHEDULE - HOME OIL**

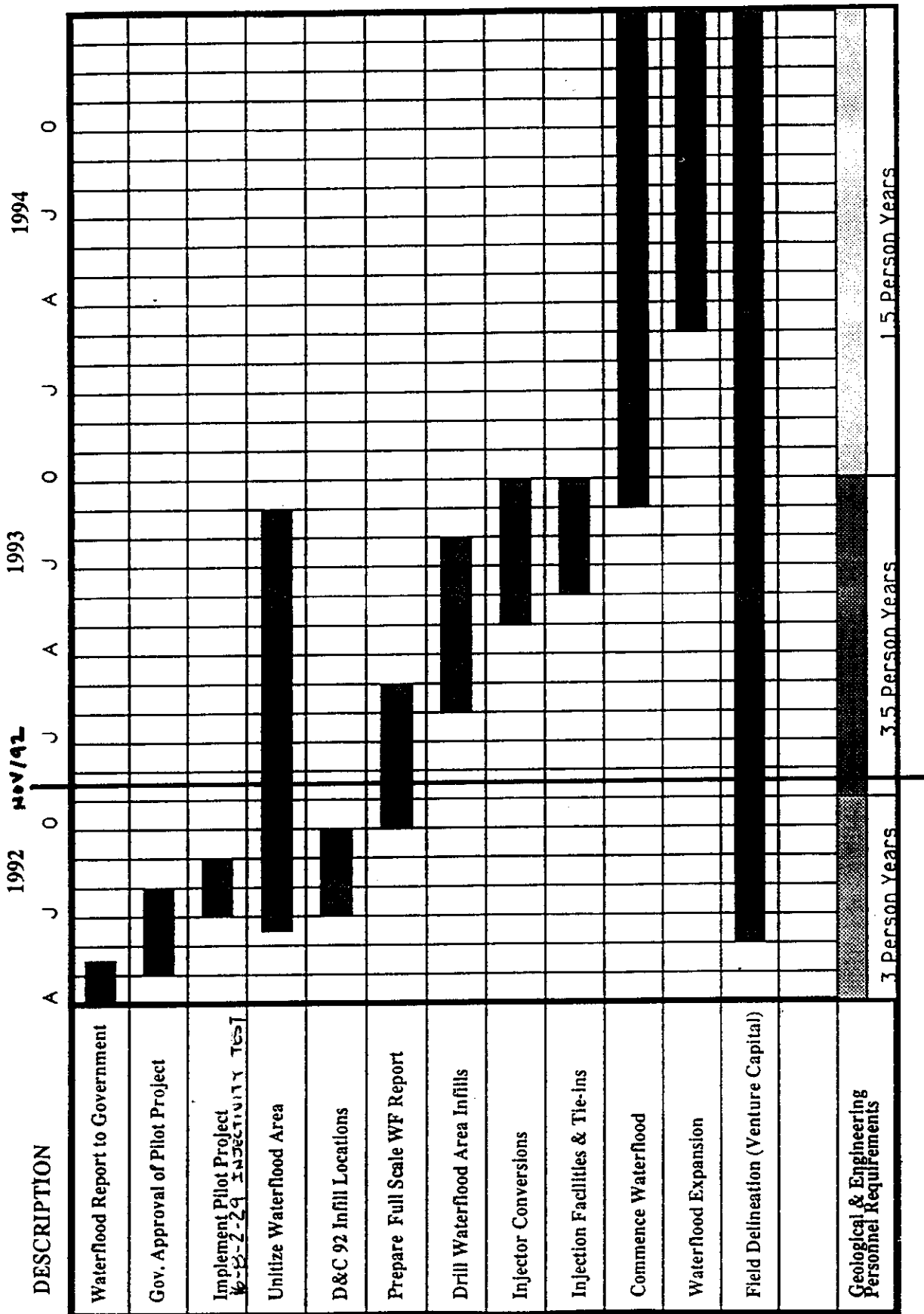
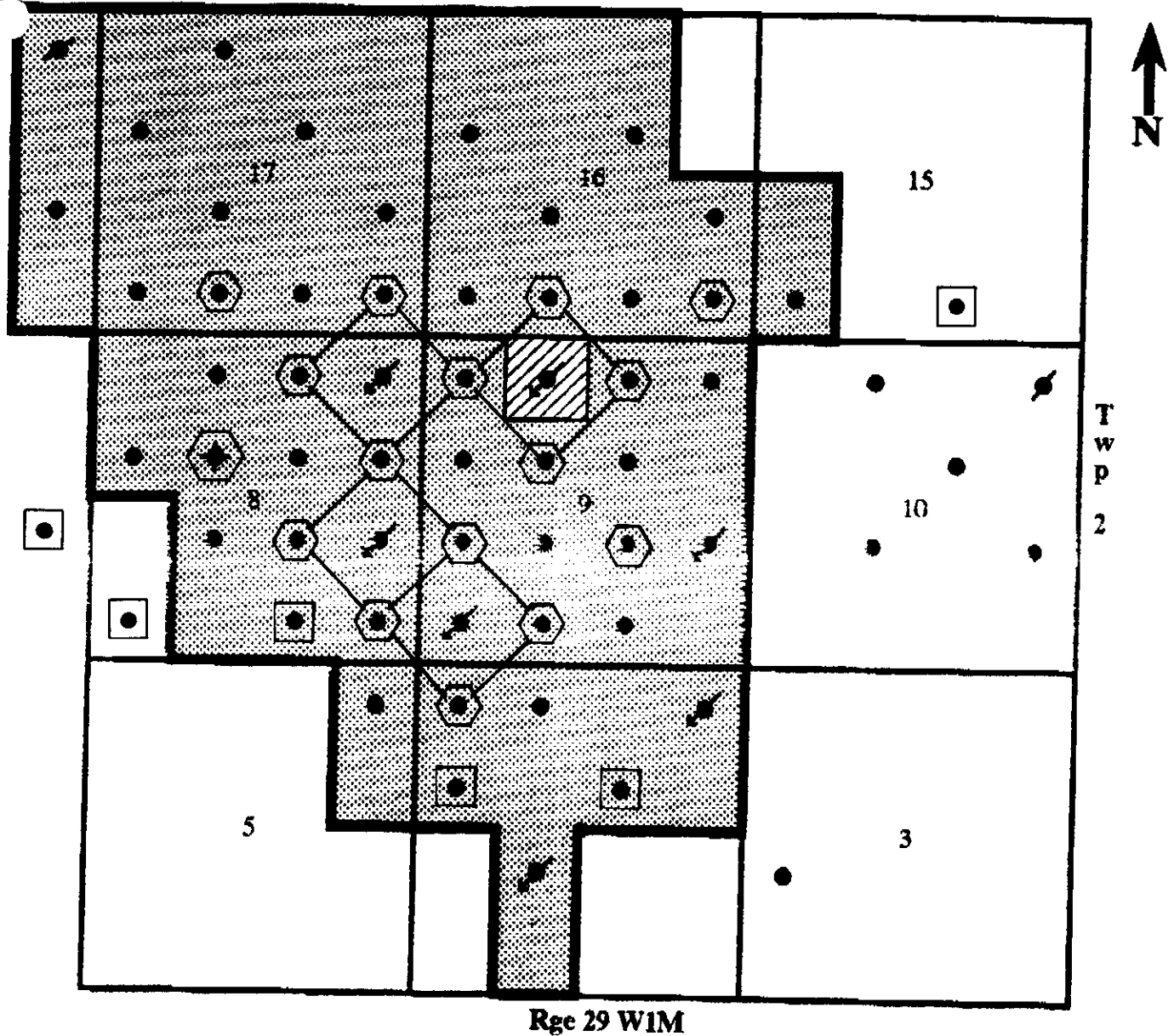


FIGURE 2

# SOUTH PIERSON, Manitoba



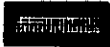





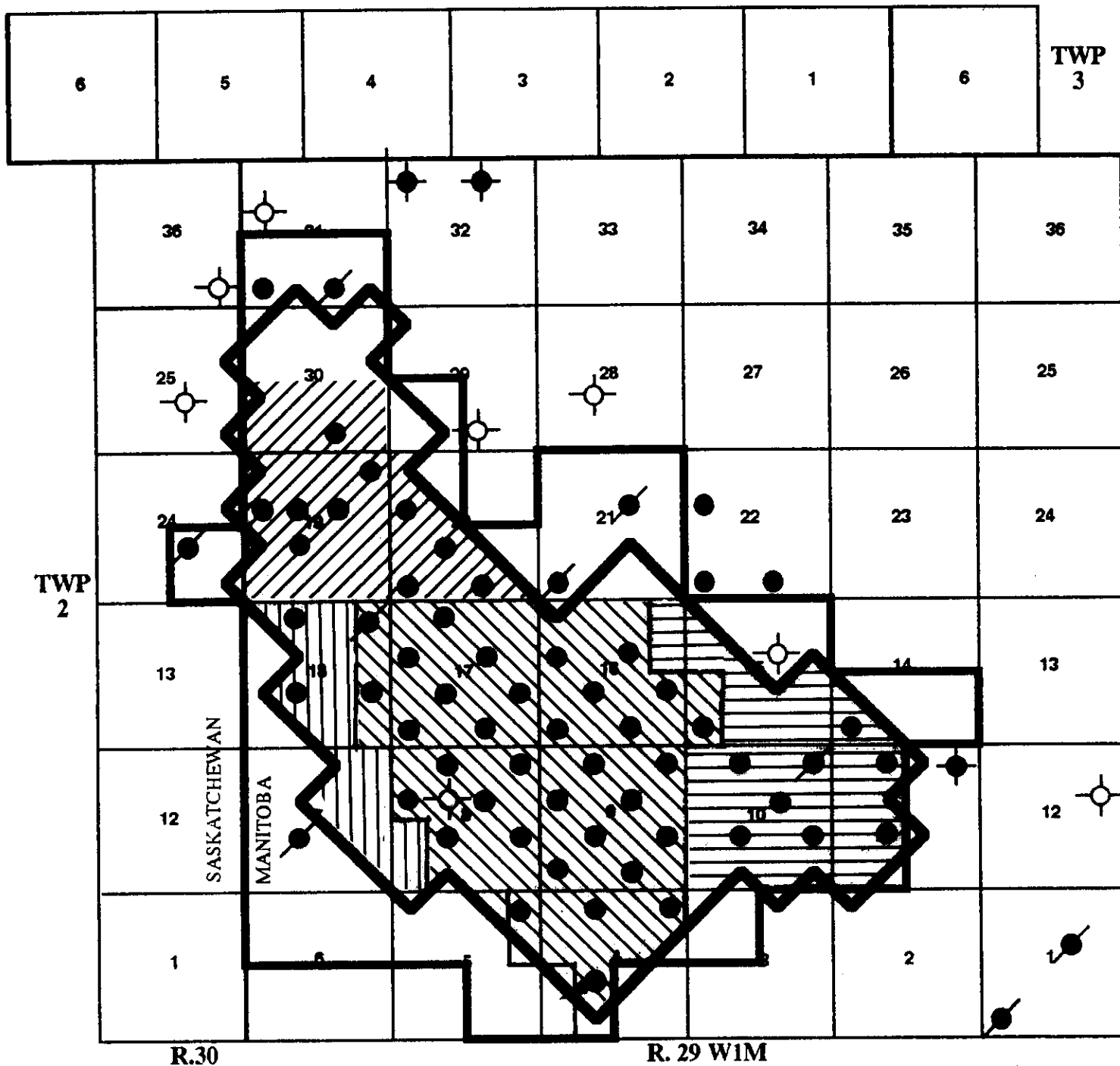
-  **Proposed Waterflood Area PHASE I**
-  **Central Facilities**
-  **Current Producing Wells**
-  **1993 32 ha Wells**
-  **1993 Infill Wells**
-  **INJECTOR CONVERSIONS**

FIGURE 3

FIGURE 4

# PIERSON AREA



— Project Area

— Waterflood Area

● CURRENT WELLS

● H2O DISP. WELL

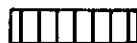
PHASE I



PHASE II



PHASE III



PHASE IV

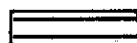
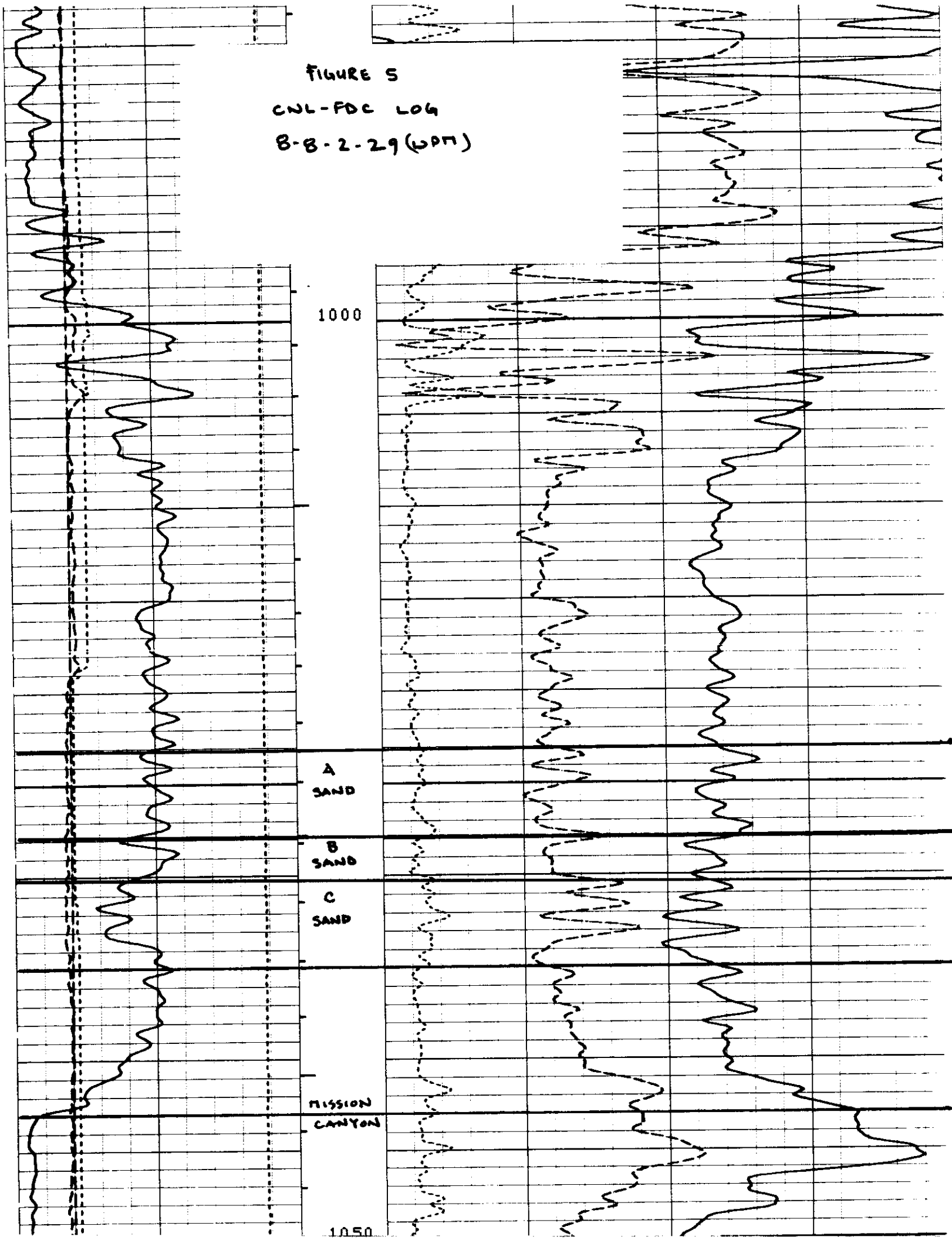




FIGURE 5  
CNL-FDC LOG  
8-8-2-29 (WPM)



Pierson

3

FIGURE 6 - RESERVOIR PRESSURE

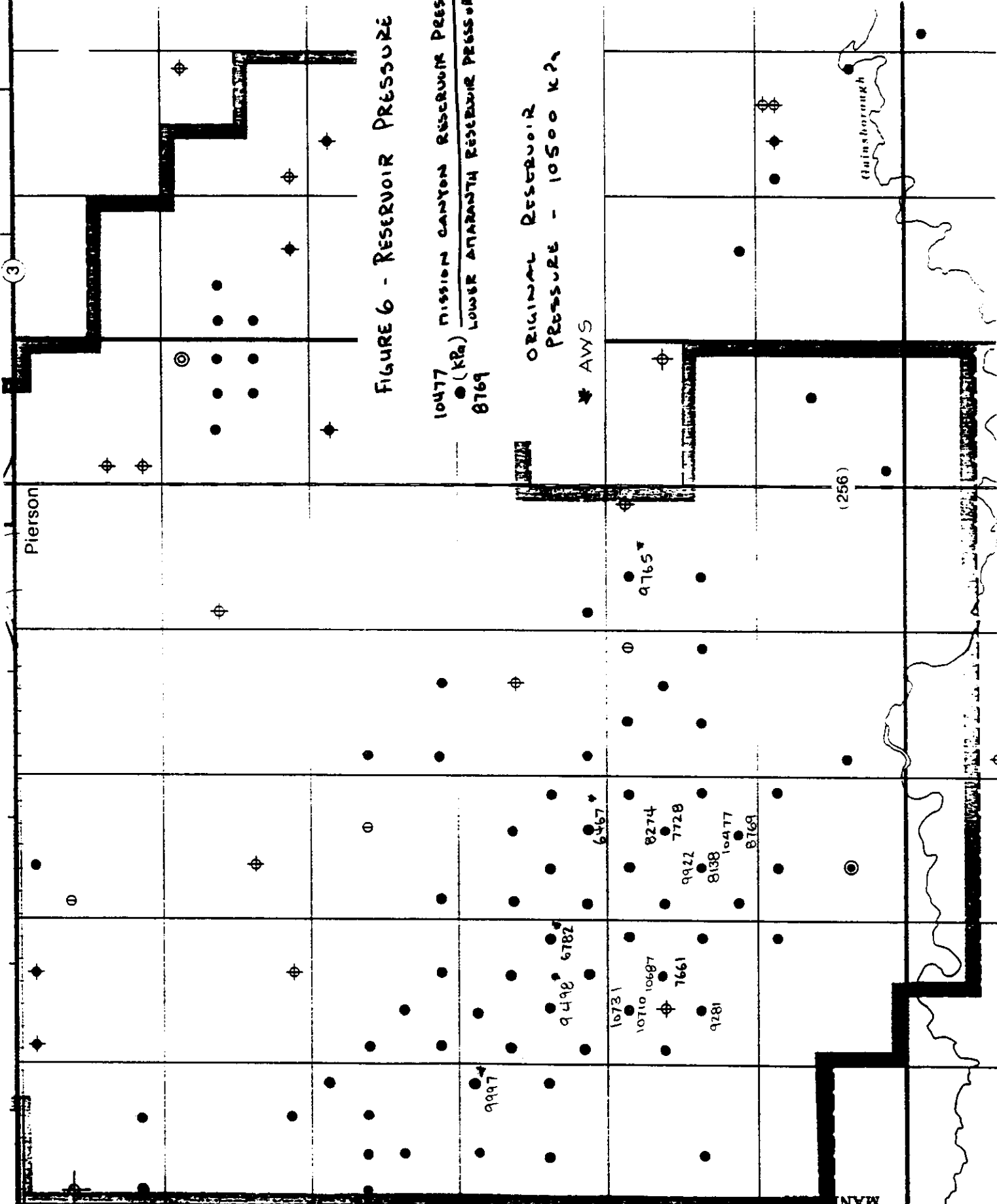
10477 MISSION CANYON RESERVOIR PRESSURE  
 • (KPa)  
 8769 LOWER ANAETHA RESERVOIR PRESSURE

ORIGINAL RESERVOIR  
 PRESSURE - 10500 KPa

★ AWS

(256)

Quinsborough





Twp 02

SASKATCHEWAN

MAN

C POOL

E POOL

St. John's

Pierston

G Pool

AREA OF APPLICATION

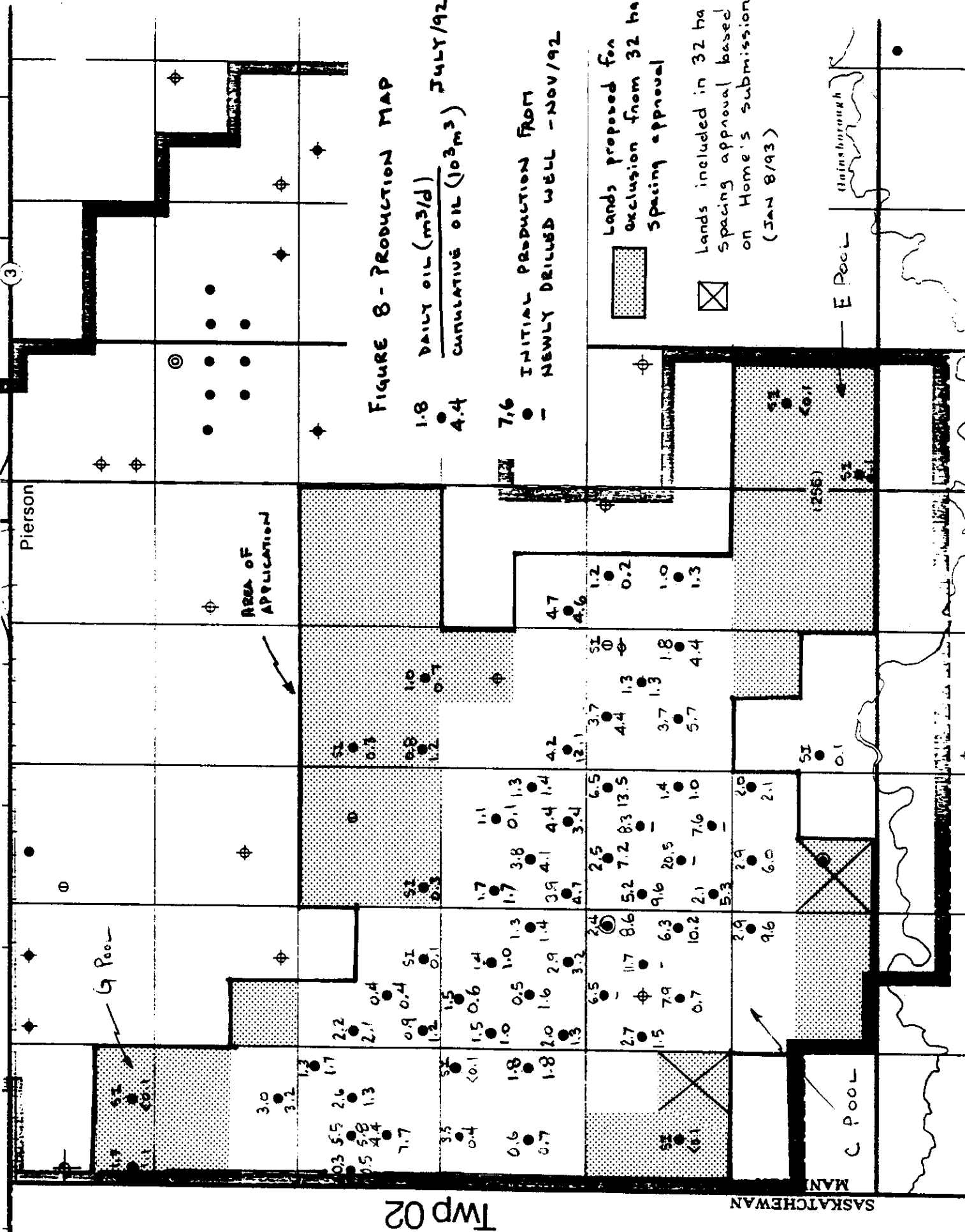
FIGURE 8 - PRODUCTION MAP

1.8 DAILY OIL (m3/d) JULY/92  
4.4 CUMULATIVE OIL (103m3)

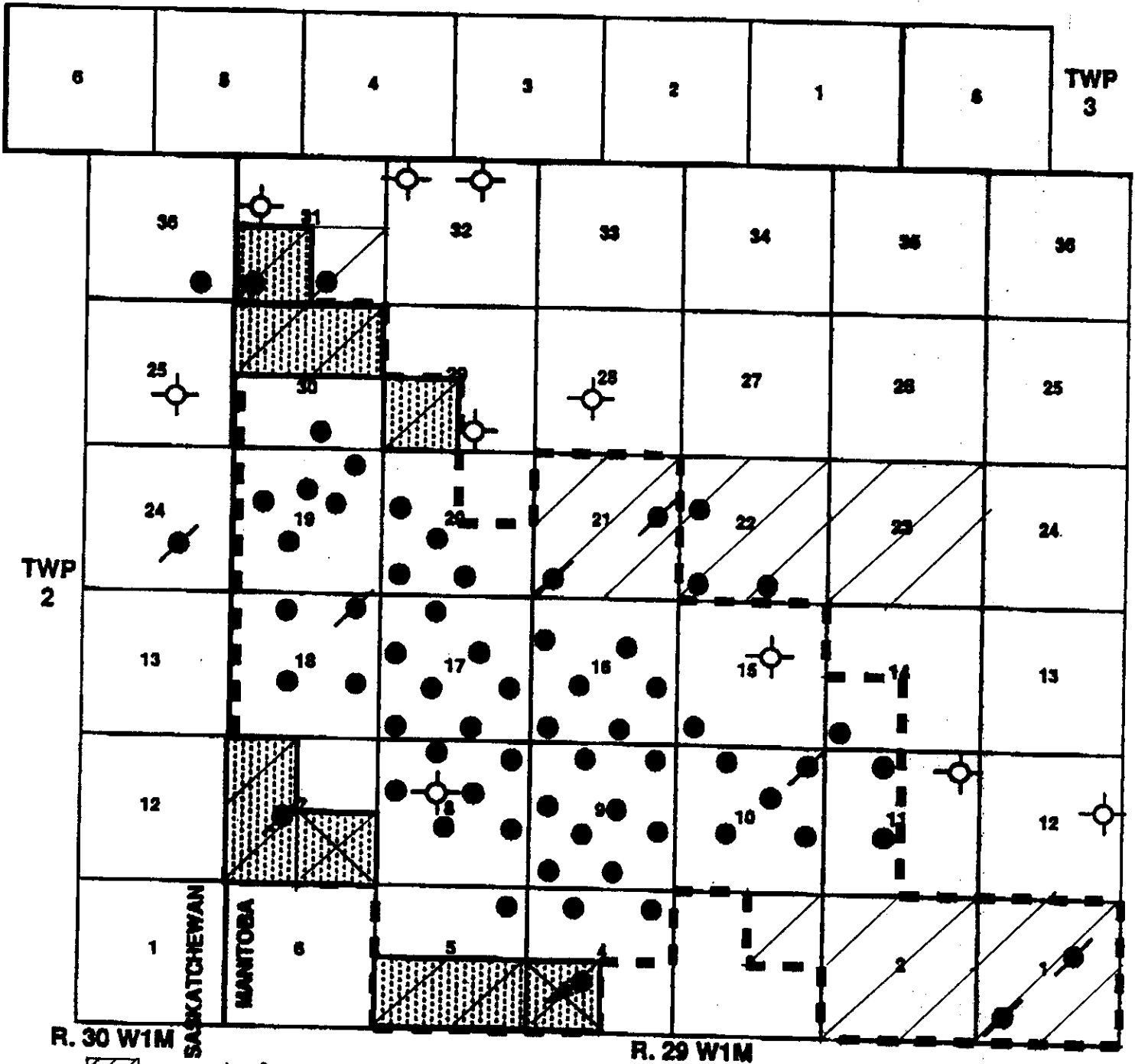
7.6 INITIAL PRODUCTION FROM  
- NEWLY DRILLED WELL - NOV/92

Lands proposed for  
exclusion from 32 ha  
Spacing approval

Lands included in 32 ha  
Spacing approval based  
on Home's submission  
(JAN 8/93)



## SOUTH PIERSON AREA



Lands Proposed by  
the Branch for exclusion  
from 32 ha Spacing Approval

Lands Requested for  
Inclusion in 32 ha  
Spacing Approval by Home Oil (JAN 8/93)



Additional Lands Proposed for inclusion in  
32 ha spacing approval by Branch after  
reviewing Home's (Jan 8/93) Submission

FIGURE 9

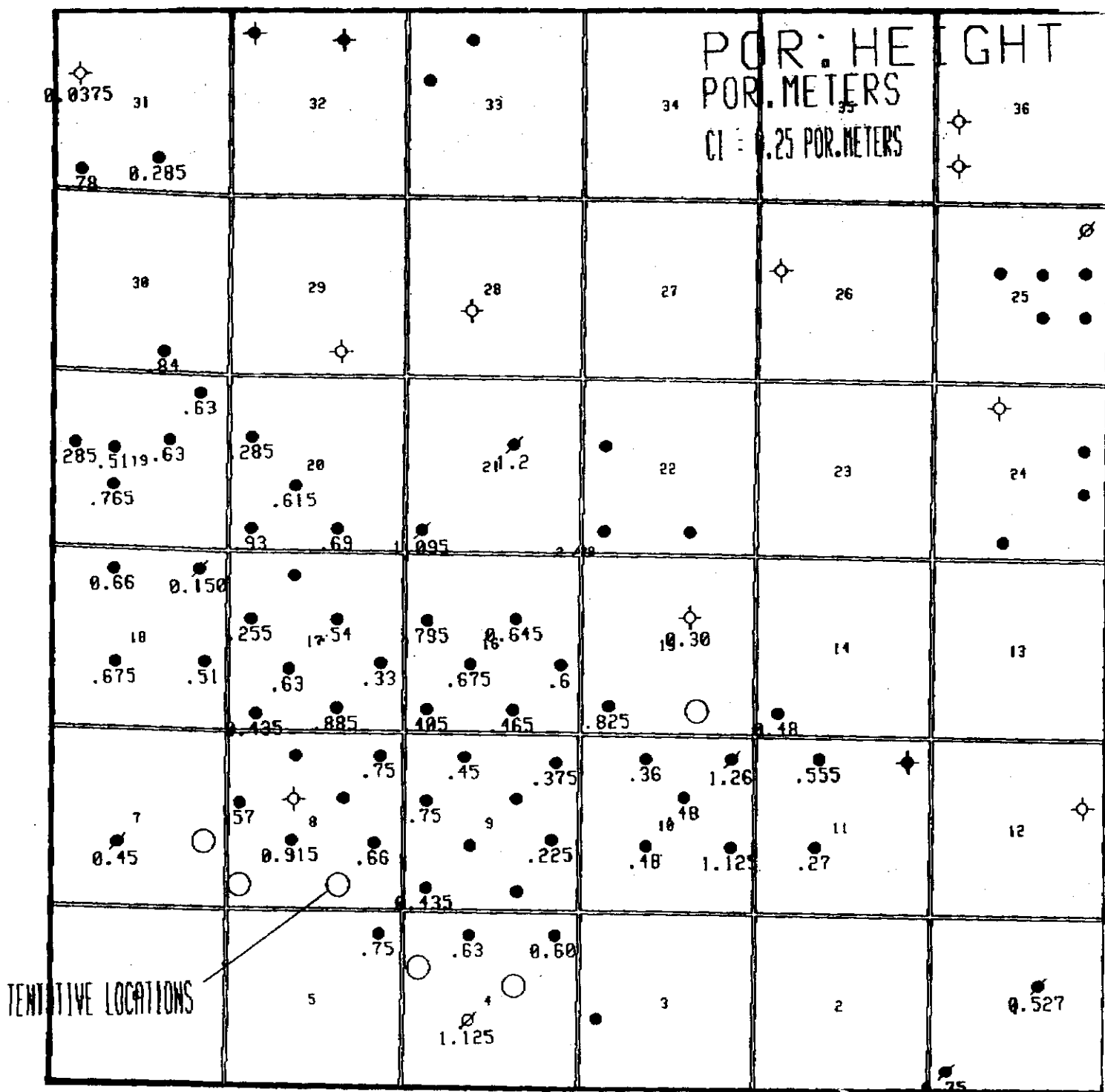
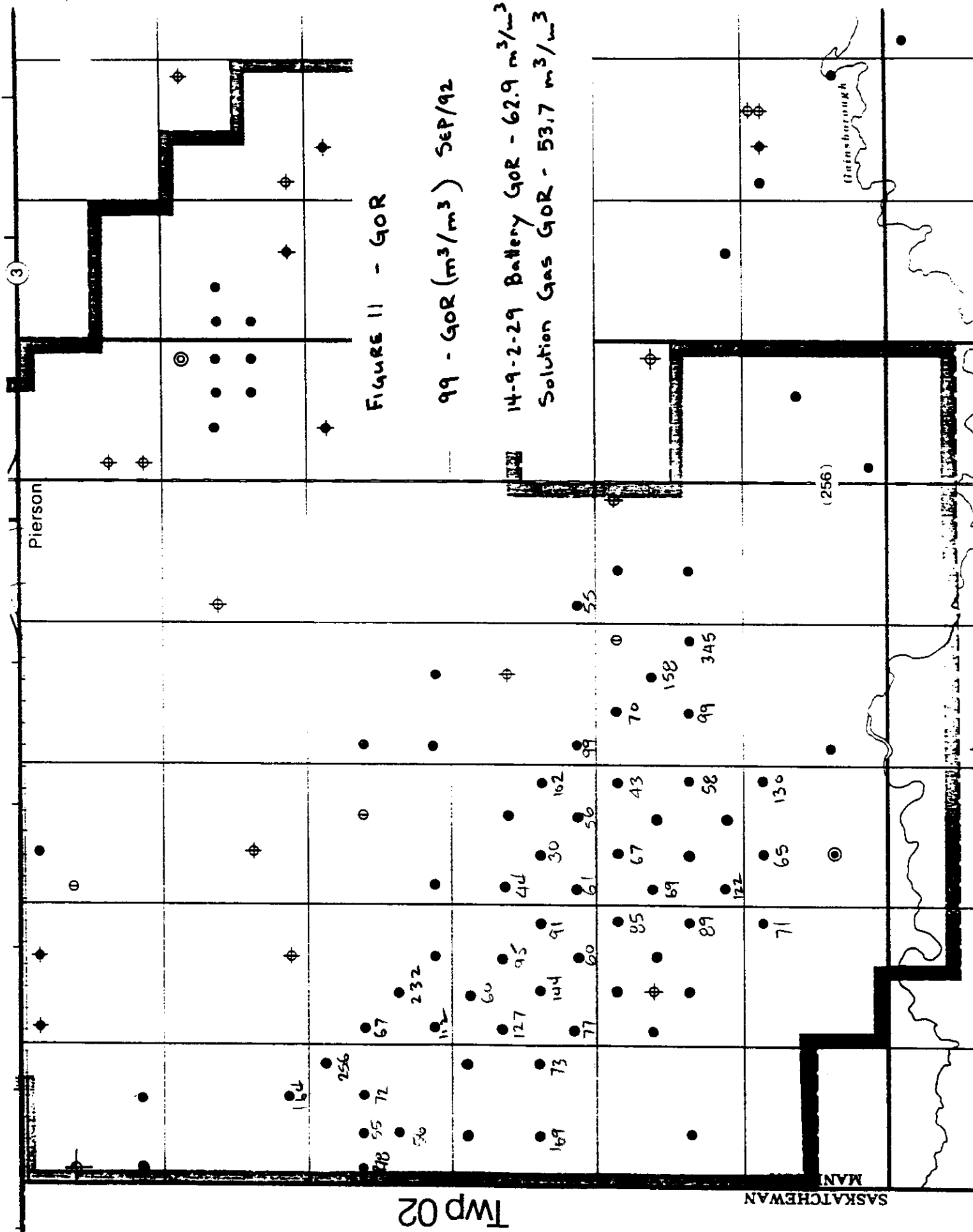


FIGURE 10  
Øh MAP

Twp 02

SASKATCHEWAN

MANI





The Oil and Natural Gas  
Conservation Board

555 — 330 Graham Avenue  
Winnipeg MB R3C 4E3  
CANADA

(204) 945-1111  
FAX: (204) 945-0586

Mr. Robert G. Puchniak  
President  
Tundra Oil and Gas Ltd.  
1313 One Lombard Place  
Winnipeg, MB R3B 0X3

Dear Mr. Puchniak:

**Re: Application for Continuation of 32 ha  
Spacing in the Pierson Area**

The Board has completed its review of Tundra's and Home Oil's applications for continuation of 32 ha spacing for the Lower Amaranth Formation in the Pierson area. Attached is a copy of Board Order No. SU 9 approving 32 ha spacing for both the Lower Amaranth and Mission Canyon Formations in a portion of the area of application.

In its preliminary review of reservoir characteristics and production performance the Board identified Tundra's wells in Section 22-2-29 (WPM) as being incapable of effectively draining 32 ha. Section 23-2-29 (WPM), while undrilled, is expected to have similar reservoir characteristics. Tundra was requested by the Board (June 2, 1992) to comment on the continued applicability of 32 ha spacing for these lands. No reply to the Board's letter was received. The Board has concluded that 32 ha spacing will not maximize recovery in Sections 22 & 23-2-29 (WPM) and may unnecessarily restrict development of these lands. Therefore Tundra's lands in Sections 22 & 23-2-29 (WPM) are not included in Board Order No. SU 9 and effective the date of this order, spacing for these lands reverts back to 16 ha.

If you have any questions in respect to this matter, please contact L.R. Dubreuil, Director of Petroleum or John N. Fox, Chief Petroleum Engineer at 945-6573 or 945-6574, respectively.

Yours respectfully,

H. Clare Moster  
Deputy Chairman

Attachments.





The Oil and Natural Gas  
Conservation Board

555 — 330 Graham Avenue  
Winnipeg MB R3C 4E3  
CANADA

(204) 945-1111  
FAX: (204) 945-0586

Mr. Jan Olthof, P.Eng.  
Manager, Southern Production  
Home Oil Company Limited  
1600 Home Oil Tower  
324 8th Avenue SW  
Calgary, AB T2P 2Z5

Dear Mr. Olthof:

**Re: Application for Continuation of 32 ha  
Spacing and Increased Maximum Permissible Production  
Rates in the Pierson Area**

The Board has completed its review of the subject applications. Attached is a copy of Board Order No. SU 9 approving 32 ha spacing for both the Lower Amaranth and Mission Canyon Formations in a portion of the area of application.

The Board has denied Home's application for continuation of increased maximum permissible production rates (MPPR's) in the Pierson area.

#### Continuation of 32 ha Spacing

In its preliminary review of reservoir characteristics and production performance the Board identified lands within the area of application where, in the Board's opinion, wells are not effectively draining 32 ha. Also identified were undrilled lands at or near the productive limits of the Pierson Lower Amaranth C, E and G Pools expected to have similar reservoir characteristics.

Home was requested by the Board (April 4, 1992) to comment on the continued applicability of 32 ha spacing for these lands. Home commented that reducing spacing would not likely lead to increased development and indicated it would provide a list of lands where 16 ha spacing was considered appropriate. Home submitted oh mapping and development drilling plans (January 8, 1993) in support of its request to continue 32 ha spacing on 2 1/2 sections proposed for exclusion from the Board's 32 ha spacing approval.

The Board has reviewed Home's submission and finds it difficult, based on Home's øh mapping, to include marginally productive or non-developed lands in the 32 ha spacing approval at this time. However, in recognition of Home's 1993 winter drilling plans, the Board has decided to include the SW/4 of Section 4 and the SE/4 of Section 7 in Township 2, Range 29(WPM) in Board Order No. SU 9.

Effective the date of this order, spacing for the lands not included in Board Order No. SU9 reverts back to 16 ha. Board Order No. SU 9 includes a provision allowing the Board to modify the area approved under the order from time to time to accommodate additional lands proved up by development drilling and to allow reduced spacing within the waterflood project area.

#### Denial of Continuation of Increased MPPR's

In August 1992, there were no wells in the Pierson Lower Amaranth C, E, and G Pools capable of producing at the original MPPR of  $9.5 \text{ m}^3/\text{d}$  and  $240 \text{ m}^3/\text{month}$ . In Home's response to the Board's deficiency letter (April 10, 1992), the company indicated increased MPPR's were needed to recover post-stimulation flush zone production from newly drilled wells, as such production can significantly enhance development drilling economics. Subsection 51(5) of The Petroleum Drilling and Production Regulation ('the regulation') was introduced in 1990 to permit a well to accumulate without penalty,  $500 \text{ m}^3$  of over-production during the first six months the well produces. This over-production allowance effectively increases the MPPR during the first six months a well produces from  $240 \text{ m}^3/\text{month}$  to  $320 \text{ m}^3/\text{month}$ .

In its preliminary waterflood study Home indicated that reservoir depletion in the Pierson Lower Amaranth C Pool is a concern. Home indicated some wells are already producing above the solution GOR and the company anticipates average reservoir pressure in the pool will decline below the bubble point in one to three years.

The Board believes reservoir depletion and the potential negative impact on ultimate recovery if implementation of pressure maintenance is delayed, is a major concern in the Pierson Lower Amaranth C Pool. Continuation of increased MPPR's may increase reservoir withdrawals and accelerate reservoir depletion. For these reasons, Home's application for continuation of increased MPPR's for the Pierson Lower Amaranth C, E, and G Pools is denied. Effective February 1, 1993, the MPPR for these pools will be as set out in Schedule D of the regulation;  $9.5 \text{ m}^3/\text{day}$  and  $240 \text{ m}^3/\text{month}$ . When a pressure maintenance scheme is implemented MPPR restrictions may, on application and in the absence of equity or conservation concerns, be waived within the waterflood project area.

Other Matters

Home Oil is requested to keep the Petroleum Branch informed of the status of the following matters;

- (1) unit negotiations,
- (2) preparation of a pressure maintenance application,
- (3) 1993 pressure survey plans, and
- (4) the Mission Canyon geological and reservoir study.

If you have any questions in respect to these matters, please contact L.R. Dubreuil, Director of Petroleum or John N. Fox, Chief Petroleum Engineer at 945-6573 or 945-6574, respectively.

Yours respectfully,

H. Clare Moster  
Deputy Chairman

Attachments.



The Oil and Natural Gas  
Conservation Board

555 — 330 Graham Avenue  
Winnipeg MB R3C 4E3  
CANADA

(204) 945-1111  
FAX: (204) 945-0586

Mr. Doug Southam  
Box 243  
Melita, MB R3B 0X3

Dear Mr. Southam:

**Re: Home Oil's Application for Continuation of 32 ha  
Spacing in the Pierson Area**

The Board has completed its review of Home's and Tundra's applications for continuation of 32 ha spacing for the Lower Amaranth Formation in the Pierson area. Home has also requested that 32 ha spacing be extended to include the Mission Canyon Formation. Attached is a copy of Board Order No. SU 9 approving 32 ha spacing for both the Lower Amaranth and Mission Canyon Formations in a portion of the area of application.

In its review of reservoir characteristics and production performance the Board has determined that wells in the better quality portions of the Pierson Lower Amaranth C Pool are capable of effectively draining 32 ha. However, wells at or near the productive limits of the Lower Amaranth Formation are not capable of draining 32 ha. Effective on the date of Board Order No. SU 9, spacing for these lands reverts back to 16 ha.

As you are aware from Home's letter dated May 15, 1992 the company has tentative plans to implement a waterflood in a portion of the Pierson Lower Amaranth C Pool in 1993. Home is planning to conduct waterflooding on 16 ha spacing by drilling infill wells and converting the existing wells to water injection. Waterflooding has been successful in the Lower Amaranth Formation in the Waskada Field and is expected to significantly increase oil recovery in the Pierson Field.

If you have any questions in respect to this matter, please contact L.R. Dubreuil, Director of Petroleum or John N. Fox, Chief Petroleum Engineer at 945-6573 or 945-6574, respectively.

Yours respectfully,

H. Clare Moster  
Deputy Chairman

Attachments.



The Oil and Natural Gas  
Conservation Board

555 — 330 Graham Avenue  
Winnipeg MB R3C 4E3  
CANADA

(204) 945-1111  
FAX: (204) 945-0586

## Order No. SU 9

An Order Pertaining to Drilling Spacing Units  
Pierson Area  
Lower Amaranth and Mission Canyon Formations

WHEREAS, clause (9)(b) of section 62 of "The Mines Act", being Chapter M160 of the Continuing Consolidation of the Statutes of Manitoba, provides as follows:

"62(9) Without restricting the generality of subsection (8) the board, with the approval of the minister, may make orders

(b) respecting the designation of the area that shall be allocated to a well in connection with fixing allowable production;"

AND WHEREAS, clause (1)(f) of section 63 of "The Mines Act" provides in part as follows:

"63(1) For the purpose of carrying out the provisions of this Part and Part III according to their intent, the Lieutenant Governor in Council may make such regulations and orders as are ancillary thereto, and are not inconsistent therewith; and every such regulation or order made under, and in accordance with the authority granted by, this section has the force of law; and, without restricting the generality of the foregoing, the Lieutenant Governor in Council may make regulations and orders

(f) prescribing spacing units and the size and shape of spacing units;"

AND WHEREAS, subsection (1) of section 20 of Manitoba Regulation 430/87R under The Mines Act ("the Petroleum Drilling and Production Regulation") provides as follows:

"20(1) Notwithstanding section 19, the board may, after a public hearing or after publication of notice, prescribe by order special drilling spacing units which may differ from normal drilling spacing units in size, shape or target area."

AND WHEREAS, subsection (3) of section 21 of the Petroleum Drilling and Production Regulation provides as follows:

"21(3) Where a special drilling spacing unit is prescribed under section 20, the board may prescribe the target area within which a well shall be completed in order to qualify for a maximum permissible production rate based on the area of the special drilling spacing unit."

AND WHEREAS, the Board received an application dated September 26, 1991 from Home Oil Company Limited and an application dated October 1, 1991 from Tundra Oil and Gas Ltd. for continuation of special 32 ha drilling spacing units for the Lower Amaranth Formation in the Pierson area ("the area of application"). Home Oil Company Limited also applied for approval of special 32 ha drilling spacing units for the Mission Canyon Formation.

AND WHEREAS, upon publication of notice of the application, the Board received an objection to the application.

AND WHEREAS, upon due consideration of the said applications and objection thereto, the Board considers continuation of special 32 ha drilling spacing units for the Lower Amaranth Formation and establishment of special 32 ha drilling spacing units for the Mission Canyon Formation in a portion of the area of application to be reasonable and desirable.

NOW THEREFORE, the Board orders that:

1. The spacing unit for each well drilled, or to be drilled, for the purpose of obtaining oil from the Jurassic Lower Amaranth Formation or the Mississippian Mission Canyon Formation within the area outlined on Schedule A is two legal subdivisions comprising the east half or the west half of a quarter section.
2. The target area of each drilling spacing unit shall be a square area in the even-numbered legal subdivision having sides one hundred metres from the sides of the legal subdivision and parallel to them.

3. The area outlined on Schedule A may be modified by the Board from time to time to meet changing circumstances.
4. Board Order No. SU 6 dated July 27, 1990 is hereby rescinded.

---

H. Clare Moster  
Deputy Chairman

---

David Tomasson  
Chairman

OIL AND NATURAL GAS  
CONSERVATION BOARD ORDER  
NO. SU 9 APPROVED THIS  
DAY OF A.D., 1993  
AT THE CITY OF WINNIPEG.

APPROVED:

---

James E. Downey  
Minister of Energy and Mines



**Order No. SU 9**

An Order Pertaining to Drilling Spacing Units  
Pierson Area  
Lower Amaranth and Mission Canyon Formations

WHEREAS, clause (9)(b) of section 62 of "The Mines Act", being Chapter M160 of the Continuing Consolidation of the Statutes of Manitoba, provides as follows:

"62(9) Without restricting the generality of subsection (8) the board, with the approval of the minister, may make orders

(b) respecting the designation of the area that shall be allocated to a well in connection with fixing allowable production;"

AND WHEREAS, clause (1)(f) of section 63 of "The Mines Act" provides in part as follows:

"63(1) For the purpose of carrying out the provisions of this Part and Part III according to their intent, the Lieutenant Governor in Council may make such regulations and orders as are ancillary thereto, and are not inconsistent therewith; and every such regulation or order made under, and in accordance with the authority granted by, this section has the force of law; and, without restricting the generality of the foregoing, the Lieutenant Governor in Council may make regulations and orders

(f) prescribing spacing units and the size and shape of spacing units;"



AND WHEREAS, subsection (1) of section 20 of Manitoba Regulation 430/87R under The Mines Act ("the Petroleum Drilling and Production Regulation") provides as follows:

"20(1) Notwithstanding section 19, the board may, after a public hearing or after publication of notice, prescribe by order special drilling spacing units which may differ from normal drilling spacing units in size, shape or target area."

AND WHEREAS, subsection (3) of section 21 of the Petroleum Drilling and Production Regulation provides as follows:

"21(3) Where a special drilling spacing unit is prescribed under section 20, the board may prescribe the target area within which a well shall be completed in order to qualify for a maximum permissible production rate based on the area of the special drilling spacing unit."

AND WHEREAS, the Board received an application dated September 26, 1991 from Home Oil Company Limited and an application dated October 1, 1991 from Tundra Oil and Gas Ltd. for continuation of special 32 ha drilling spacing units for the Lower Amaranth Formation in the Pierson area ("the area of application"). Home Oil Company Limited also applied for approval of special 32 ha drilling spacing units for the Mission Canyon Formation.

AND WHEREAS, upon publication of notice of the application, the Board received an objection to the application.

AND WHEREAS, upon due consideration of the said applications and objection thereto, the Board considers continuation of special 32 ha drilling spacing units for the Lower Amaranth Formation and establishment of special 32 ha drilling spacing units for the Mission Canyon Formation in a portion of the area of application to be reasonable and desirable.

NOW THEREFORE, the Board orders that:

1. The spacing unit for each well drilled, or to be drilled, for the purpose of obtaining oil from the Jurassic Lower Amaranth Formation or the Mississippian Mission Canyon Formation within the area outlined on Schedule A is two legal subdivisions comprising the east half or the west half of a quarter section.
2. The target area of each drilling spacing unit shall be a square area in the even-numbered legal subdivision having sides one hundred metres from the sides of the legal subdivision and parallel to them.

3. The area outlined on Schedule A may be modified by the Board from time to time to meet changing circumstances.
4. Board Order No. SU 6 dated July 27, 1990 is hereby rescinded.

---

H. Clare Moster  
Deputy Chairman

---

David Tomasson  
Chairman

OIL AND NATURAL GAS  
CONSERVATION BOARD ORDER  
NO. SU 9 APPROVED THIS  
DAY OF A.D., 1993  
AT THE CITY OF WINNIPEG.

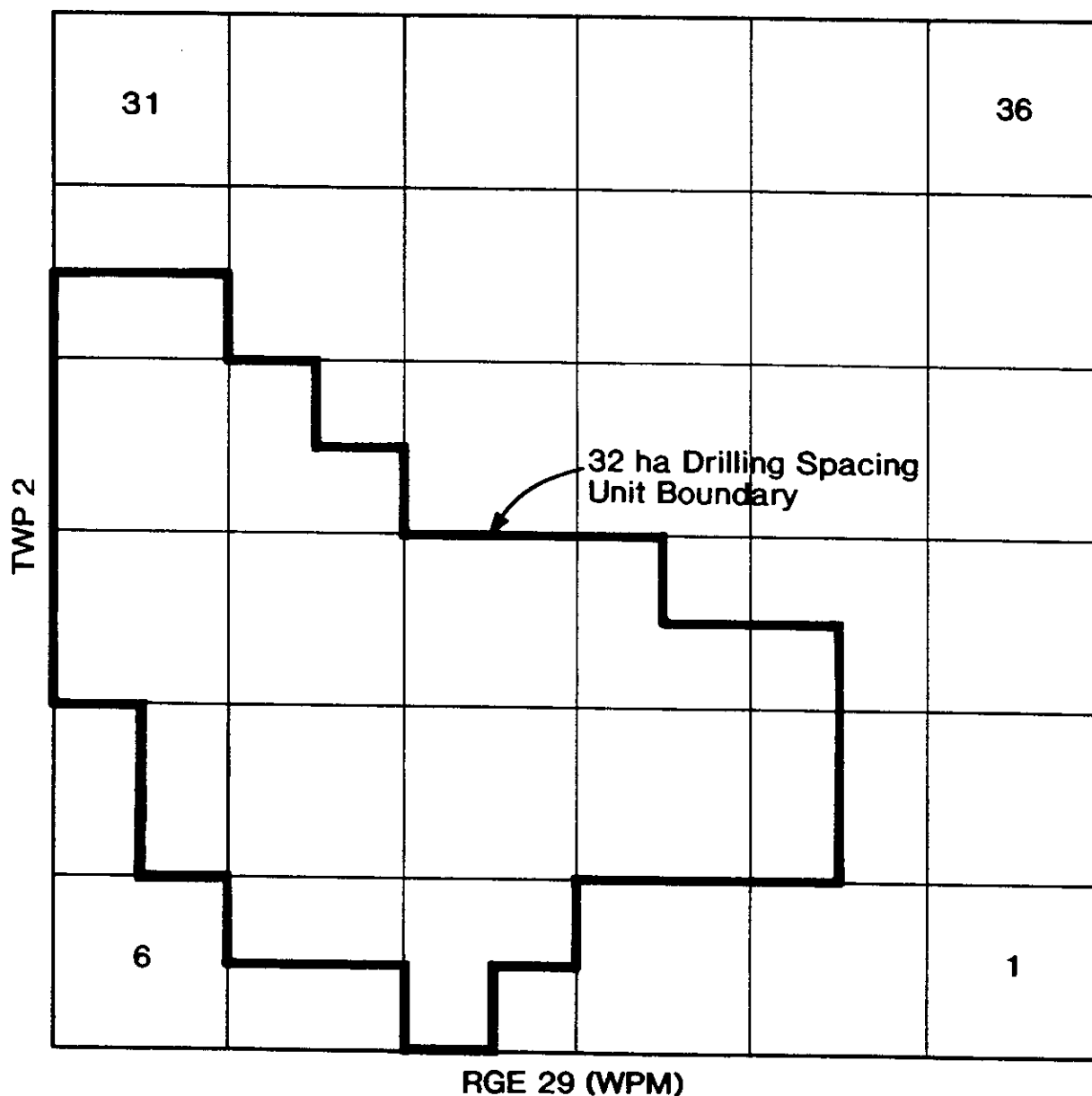
APPROVED:

---

James E. Downey  
Minister of Energy and Mines

**BOARD ORDER NO. SU 9  
SCHEDULE A**

**PIERSON AREA  
32 ha DRILLING SPACING UNITS  
LOWER AMARANTH AND MISSION CANYON FORMATIONS**



**Home Oil Company Limited**

1600 Home Oil Tower  
324 Eighth Avenue S.W.  
Calgary, Alberta T2P 2Z5  
Telephone (403) 232-7100  
Fax (403) 232-7678

06 Jan 1993

Manitoba Energy and Mines  
Petroleum Branch  
555 - 330 Graham Avenue  
Winnipeg, Manitoba  
R3C 4E3

Attention: Mr. J.N. Fox  
Chief Petroleum Engineer, Petroleum Branch

Dear Sir:

Re: Retained 32 Hectare Spacing  
South Pierson Field, Lower Amaranth Pools

Attached is two Porosity Height Maps (PHI\*H) a table of the current and ultimate primary recovery estimates for Home's Lower Amaranth wells, production information from our most recent wells and a general map showing our desired areas for continuation of 32.4 Ha. spacing. The mapping shows the presence of relatively high quality reservoir in some areas that the Manitoba Energy and Mines - Petroleum Division have considered for reduced spacing due to low productivity. Low oil productivity from a Lower Amaranth well is often not a measure of poor quality reservoir but rather, the hydraulic fracture used for stimulation has occasionally provided communication with the underlying wet Mississippian, and in certain cases, has ruined wellbore productivity.

In early 1993, Home is planning to drill several delineation wells (indicated on map) along with several 32.4 hectare wells in the delineated waterflood area. Some of these wells are scheduled in the areas which your Petroleum Branch has designated as potential 16 ha. lands. We hope that in consideration of both the mapping and the scheduled drilling, these areas can be left on 32.4 ha. spacing.

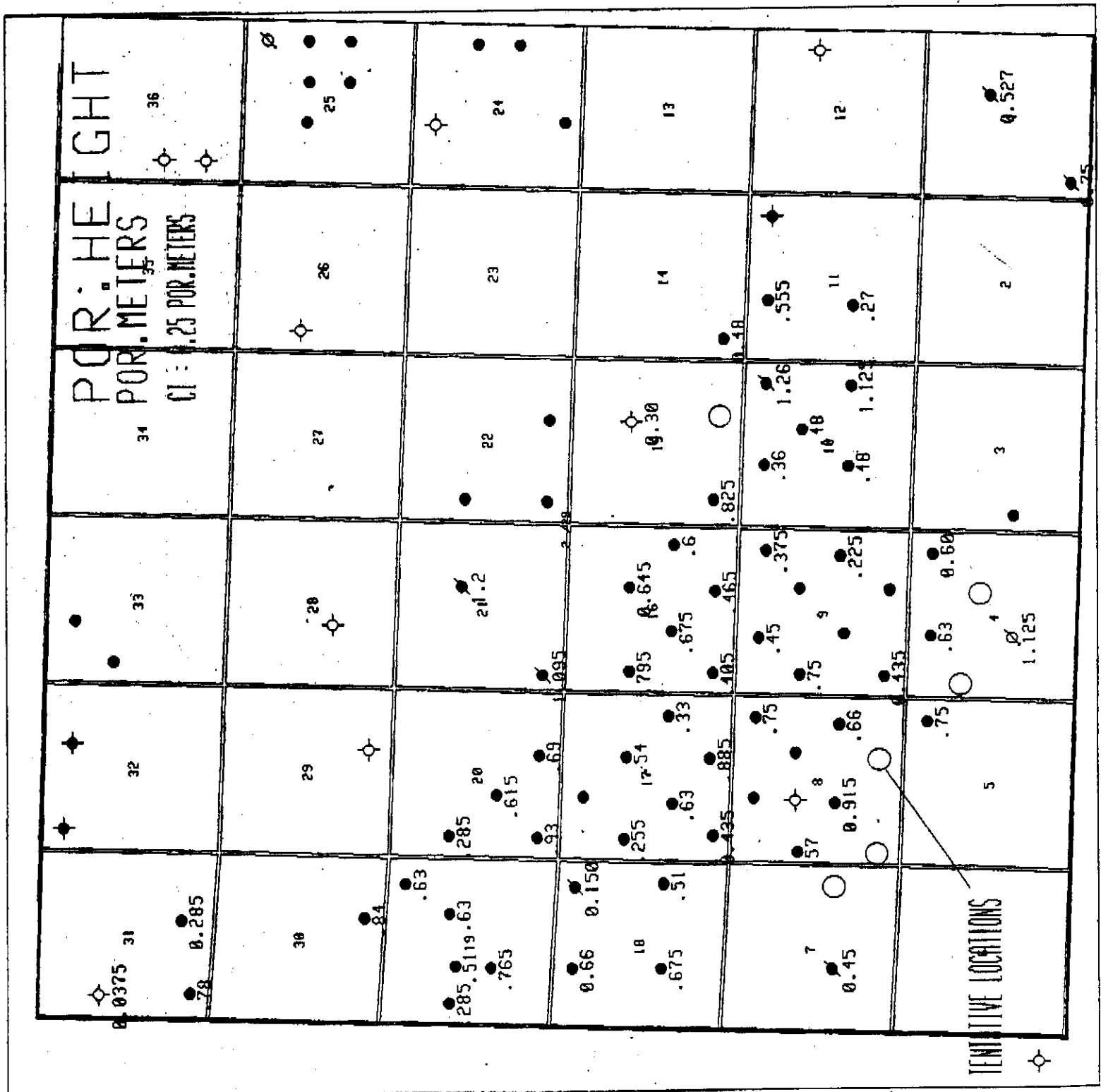
If you have any questions or concerns regarding this matter, please contact John S. Murray at (403) 232-7541.

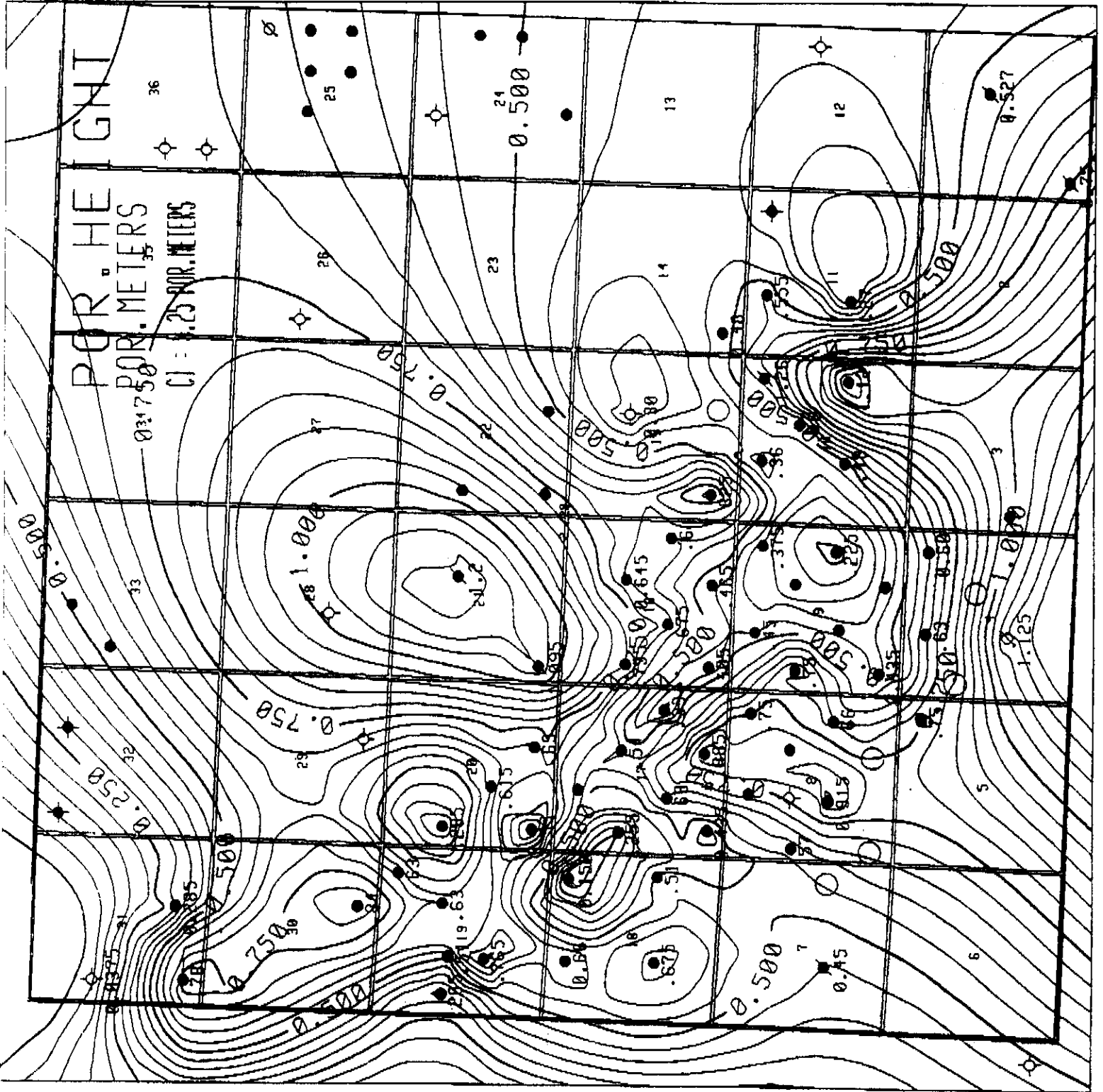
Yours truly,

HOME OIL COMPANY LIMITED



G.C.K. Johnson, P.Eng.  
Production Supervisor  
Southern District





U φh 5005

POR. HEIGHT

POR. METERS

CI: 0.25 POR. METERS

0.750

36

+

+

0

25

26

27

28

29

30

31

32

33

34

35

36

37

38

39

40

41

42

43

44

45

46

47

48

49

50

51

52

53

54

55

56

57

58

0.500

13

12

0.527

14

15

16

17

18

19

20

21

22

23

24

25

26

27

28

29

30

31

32

33

34

35

36

37

38

39

40

41

42

43

44

45

46

47

48

49

50

51

52

53

54

55

56

57

58

59

60

61

62

63

64

65

66

67

68

69

70

71

72

73

74

75

76

77

78

79

80

81

82

83

84

85

86

87

88

89

90

91

92

93

94

95

96

97

98

99

100

101

102

103

104

105

106

107

108

109

110

111

112

113

114

115

116

117

118

119

120

121

122

123

124

125

126

127

128

129

130

131

132

133

134

135

136

137

138

139

140

141

142

143

144

145

146

147

148

149

150

151

152

153

154

155

156

157

158

159

160

161

162

163

164

165

166

167

168

169

170

171

172

173

174

175

176

177

178

179

180

181

182

183

184

185

186

187

188

189

190

191

192

193

194

195

196

197

198

199

200

201

202

203

204

205

206

207

208

209

210

211

212

213

214

215

216

217

218

219

220

221

222

223

224

225

226

227

228

229

230

231

232

233

234

235

236

237

238

239

240

241

242

243

244

245

246

247

248

249

250

251

252

253

254

255

256

257

258

259

260

261

262

263

264

265

266

267

268

269

270

271

272

273

274

275

276

277

278

279

280

281

282

283

284

285

286

287

288

289

290

291

292

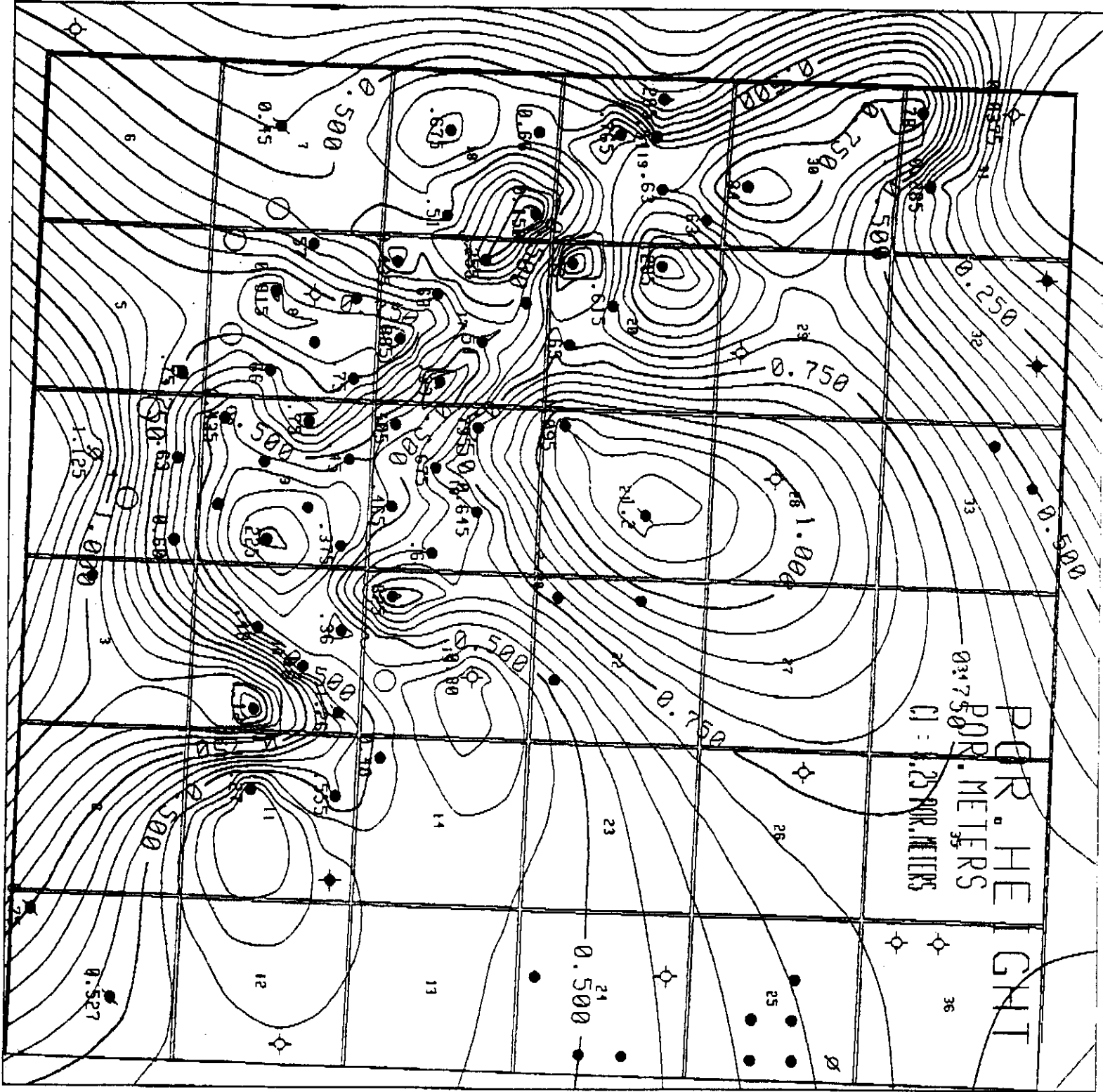
293

294

295

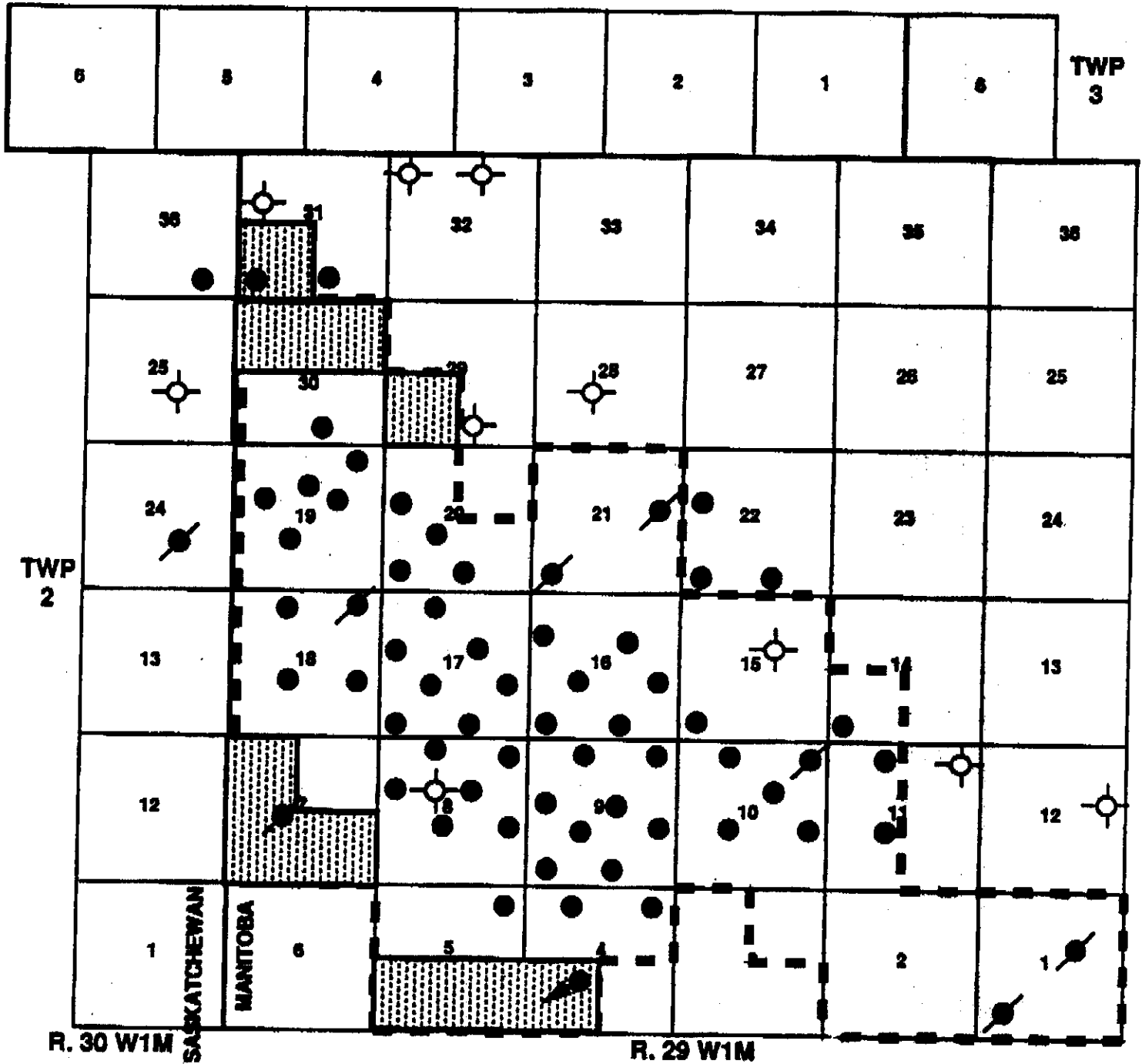
296

297





# SOUTH PIERSON AREA



Lands Requested for  
Inclusion in 32 ha  
Spacing Approval

# SOUTH PIERSON ESTIMATED RESERVES

WELL LOCATION	STATUS	G.O.L.P.** (m3/d)	PRIMARY R.O.L.P.† (m3/d)	RATE/CUM CUM PRODUCTION ESTIMATE	ESTIMATED RECOVERY %	RECOVERY (m3)
00-01-W1M	SLIP	180	19,200	115	0.08	115
00-02-W1M	UNDEVELOPED	115	11,845			0
10-04-002-W1M	PROD	77	8,300	3,300	4.26	3,139
02-05-002-W1M	UNDEVELOPED	50	5,700			0
02-05-003-W1M	PROD	50	5,720	19,250	20.97	10,569
12-05-003-W1M	PROD	50	10,300	4,000	3.84	1,833
10-05-003-W1M	PROD	100	30,704	5,772	5.84	5,772
04-05-003-W1M	PROD	40	7,300	5,600	12.45	5,417
02-05-004-W1M	PROD (SLIP)	20	5,500	2,500	4.71	2,401
10-05-005-W1M	PROD	50	9,511	15,775	14.26	340
14-05-005-W1M	PROD	70	8,600	12,670	15.80	7,503
04-15-005-W1M	PROD	115	12,100	18,500	16.13	12,336
04-15-006-W1M	PROD	40	7,200	11,600	16.10	4,978
02-10-006-W1M	SLIP (PROD)	20	5,600	1,000	4.33	889
10-10-006-W1M	PROD	50	10,100	10,000	11.40	238
10-10-007-W1M	UNDEVELOPED	50	5,400			0
06-17-008-W1M	PROD	40	7,200	3,370	4.60	1,590
02-17-008-W1M	PROD	60	6,600	3,400	5.44	1,520
12-17-008-W1M	PROD	30	5,700	2,400	7.00	1,041
02-18-009-W1M	PROD	40	5,800	4,444	5.32	1,911

10% INCREMENTAL PROBABLY WATERFLOOD RESERVE

10% INCREMENTAL POSSIBLE WATERFLOOD RESERVE

TOTAL WATERFLOOD

3400

308,740

317,472

18.7%

133,135

WELL LOCATION	STATUS	G.O.L.P.** (m3/d)	PRIMARY R.O.L.P.† (m3/d)	RATE/CUM CUM PRODUCTION ESTIMATE	ESTIMATED RECOVERY %	RECOVERY (m3)
04-01-002-W1M	SLIP	115	11,845	45	0.08	45
12-04-002-W1M	UNDEVELOPED					0
06-07-002-W1M	SLIP	50	20,200	40	0.03	40
04-10-002-W1M	UNDEVELOPED					0
02-10-002-W1M	PROD	140	15,377	6,140	4.20	4,480
12-10-002-W1M	UNDEVELOPED					0
10-10-002-W1M	PROD (SLIP)	70	7,200	3,300	11.97	4,815
04-11-002-W1M	UNDEVELOPED					0
10-11-002-W1M	UNDEVELOPED					0
04-14-002-W1M	PROD	77	8,100	15,300	17.01	4,918
02-14-002-W1M	UNDEVELOPED					0
02-15-002-W1M	PROD	100	11,000	800	0.77	600
14-15-002-W1M	PROD	50	15,400	700	0.51	546
04-15-002-W1M	UNDEVELOPED					0
02-15-003-W1M	UNDEVELOPED					0
11-19-003-W1M	PROD	50	9,511	14,075	15.40	4,113
14-19-003-W1M	PROD	100	11,700	2,000	1.80	1,219
04-20-003-W1M	PROD	140	15,700	2,300	1.53	1,230
12-20-003-W1M	PROD	150	17,100	9,000	7.23	2,020
10-21-003-W1M	SLIP	147	17,000	0	0.00	0
10-20-003-W1M	UNDEVELOPED					0
04-21-003-W1M	PROD	130	14,570	1,700	1.10	1,107

TOTAL NON-WATERFLOOD

3000

214,340

188,740

3.60

11,077

GRAND TOTAL SURVEY AREA

6400

473,080

495,216

7.18

17,605

\*NOTE: Economic Production Rate of 0.3 m3/d used.

\*\*NOTE: Based on 32.4 Ha, 14% Porosity, 55% So, and 1.196 Bo.

†NOTE: Based on a recovery factor of 10.6%.

Home Oil Company Limited / Sourry Rainbow Oil Limited  
Field Data Capture System  
Monthly Well Report

Report Month: Dec/92  
Battery: PIERSON 14-9-2-29W1  
Well: PIERSON 10-9-2-29  
Zone:  
Pump type: PLUNGER

Pool: SPEARFISH

Satellite: PORT SAT SR  
Unit: 00/10-09-002-29W1/0  
Oper: Unit: 1

Current Time: 01/04/93 16:04:17

Choke size (mm): 0.0 Well depth (jtf): 0.0  
Code: 338

P R O D U C T I O N																	T E S T				
Day	Net Hrs (hr)	Oil Used (m3)	Water Used (m3)	--- Prorated ---				Prod Oil (m3)	Prod Water (m3)	---Stroke---		Pump Eff. (%)	Casing			Op.	Hrs. Test (hr)	Oil Prod (m3)	Water Prod (m3)	Gas Prod (m3)	
				Prod Oil (m3)	Allow. Left (m3)	Prod Water (m3)	Prod Gas (m3)			Speed (spm)	Len. (cm)		TBP (kPa)	CSP (kPa)	Fluid Level (jtf)						
C/O		0.0	0.0													92/11/11	72.0	22.84	2.54	0.00	
1	24.0	0.0	0.0	8.1	0.0	0.9	0.0	0.0	0.0	5.5	152.0	0.0	413	413	109.0	JBS					
2	18.0	0.0	0.0	6.1	0.0	0.6	0.0	0.0	0.0	5.5	152.0	0.0	413	413	109.0	JBS					
3	24.0	0.0	0.0	8.1	0.0	0.9	0.0	0.0	0.0	5.5	152.0	0.0	413	413	109.0	JBS					
4	24.0	0.0	0.0	8.1	0.0	0.9	0.0	0.0	0.0	5.5	152.0	0.0	413	413	109.0	JBS					
5	24.0	0.0	0.0	6.6	0.0	0.7	0.0	0.0	0.0	5.5	152.0	0.0	413	413	109.0	JBS	72.0	18.52	2.06	0.00	
6	24.0	0.0	0.0	6.6	0.0	0.7	0.0	0.0	0.0	5.5	152.0	0.0	413	413	109.0	JBS					
7	24.0	0.0	0.0	6.6	0.0	0.7	0.0	0.0	0.0	5.5	152.0	0.0	413	413	109.0	JBS					
8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.5	152.0	0.0	344	344	84.0	LAN					
9	24.0	0.0	0.0	6.6	0.0	0.7	0.0	0.0	0.0	5.5	152.0	0.0	344	344	84.0	LAN					
10	24.0	0.0	0.0	6.6	0.0	0.7	0.0	0.0	0.0	5.5	152.0	0.0	344	310	107.0	WAN					
11	24.0	0.0	0.0	6.6	0.0	0.7	0.0	0.0	0.0	5.5	152.0	0.0	344	310	107.0	WAN					
12	24.0	0.0	0.0	6.6	0.0	0.7	0.0	0.0	0.0	5.5	152.0	0.0	344	310	107.0	WAN					
13	24.0	0.0	0.0	6.6	0.0	0.7	0.0	0.0	0.0	5.5	152.0	0.0	344	310	107.0	WAN					
14	24.0	0.0	0.0	6.6	0.0	0.7	0.0	0.0	0.0	5.5	152.0	0.0	344	310	107.0	WAN					
15	24.0	0.0	0.0	6.6	0.0	0.7	0.0	0.0	0.0	5.5	152.0	0.0	344	344	108.0	JBS					
16	24.0	0.0	0.0	6.6	0.0	0.7	0.0	0.0	0.0	5.5	152.0	0.0	344	344	108.0	JBS					
17	24.0	0.0	0.0	6.6	0.0	0.7	0.0	0.0	0.0	5.5	152.0	0.0	344	344	108.0	JBS					
18	24.0	0.0	0.0	6.6	0.0	0.7	0.0	0.0	0.0	5.5	152.0	0.0	344	344	108.0	JBS					
19	24.0	0.0	0.0	6.6	0.0	0.7	0.0	0.0	0.0	5.5	152.0	0.0	344	344	108.0	JBS					
20	24.0	0.0	0.0	6.6	0.0	0.7	0.0	0.0	0.0	5.5	152.0	0.0	344	344	108.0	JBS					
21	24.0	0.0	0.0	6.6	0.0	0.7	0.0	0.0	0.0	5.5	152.0	0.0	344	344	108.0	JBS					
22	24.0	0.0	0.0	6.6	0.0	0.7	0.0	0.0	0.0	5.5	152.0	0.0	344	344	108.0	JBS					
23	24.0	0.0	0.0	6.6	0.0	0.7	0.0	0.0	0.0	5.5	152.0	0.0	344	344	108.0	JBS					
24	24.0	0.0	0.0	6.6	0.0	0.7	0.0	0.0	0.0	5.5	152.0	0.0	344	344	108.0	JBS					
25	24.0	0.0	0.0	6.6	0.0	0.7	0.0	0.0	0.0	5.5	152.0	0.0	344	344	108.0	JBS					
26	24.0	0.0	0.0	6.6	0.0	0.7	0.0	0.0	0.0	5.5	152.0	0.0	344	344	108.0	JBS					
27	24.0	0.0	0.0	6.6	0.0	0.7	0.0	0.0	0.0	5.5	152.0	0.0	344	344	108.0	JBS					
28	24.0	0.0	0.0	6.6	0.0	0.7	0.0	0.0	0.0	5.5	152.0	0.0	344	344	108.0	JBS					
29	24.0	0.0	0.0	6.6	0.0	0.7	0.0	0.0	0.0	5.5	152.0	0.0	344	344	108.0	JBS					
30	24.0	0.0	0.0	6.6	0.0	0.7	0.0	0.0	0.0	5.5	152.0	0.0	344	344	108.0	JBS					
31	24.0	0.0	0.0	6.6	0.0	0.7	0.0	0.0	0.0	5.5	152.0	0.0	344	344	108.0	JBS					
714.0		202.2		21.2		0.0		0.0		0.0											

Hours producing load oil 0.0, load oil left to recover 0.0 m3, load water left to recover 0.0 m3

Remarks:

Oil Company Limited / Scurry Rainbow Oil Limited  
Field Data Capture System  
Monthly Well Report

Current Time: 01/04/93 16:04:00

Report Month: Dec/92

Battery: PIERSON 14-9-2-29W1

Well: PIERSON 4-9-2-29

Zone:

Pool: SPEARFISH

Satellite: 4-9 SAT

Unit: 00/06-09-002-29W1/0

Oper: Unit: 1

Choke size (mm): 0.0 Well depth (jtf): 0.0

Code: 234

Pump Type: PLUNGER

[----- P R O D U C T I O N -----]															[----- T E S T -----]					
Day	Wet Hrs (hr)	Load Oil Used (m3)	Load Water Used (m3)	--- Pro-rated ---			Prod Prod		--Stroke--		Pump Eff. (%)	Casing Fluid		Op.	Hrs. Test (hr)	Oil Prod (m3)	Water Prod (m3)	Gas Prod (m3)		
				Prod Oil (m3)	Allow. Left (m3)	Prod Water (m3)	Prod Gas (m3)	Oil (m3)	Water (m3)	Speed (spm)		Len. (cm)	TBP (kPa)						CSP (kPa)	Level (j/t)
C/O		0.0	0.0												92/11/15	72.0	43.51	20.48	0.00	
1	24.0	0.0	0.0	15.5	0.0	4.9	0.0	0.0	0.0	7.0	218.0	0.0	482	482	107.0	LAN				
2	24.0	0.0	0.0	15.5	0.0	4.9	0.0	0.0	0.0	7.0	218.0	0.0	482	482	107.0	LAN				
3	24.0	0.0	0.0	15.5	0.0	4.9	0.0	0.0	0.0	7.0	218.0	0.0	482	482	107.0	LAN				
4	24.0	0.0	0.0	15.5	0.0	4.9	0.0	0.0	0.0	7.0	218.0	0.0	482	482	107.0	LAN				
5	24.0	0.0	0.0	9.7	0.0	4.6	0.0	0.0	0.0	7.0	218.0	0.0	482	482	107.0	LAN	72.0	27.20	13.82	0.00
6	24.0	0.0	0.0	9.7	0.0	4.6	0.0	0.0	0.0	7.0	218.0	0.0	482	482	107.0	LAN				
7	24.0	0.0	0.0	9.7	0.0	4.6	0.0	0.0	0.0	7.0	218.0	0.0	482	482	107.0	JBS				
8	24.0	0.0	0.0	9.7	0.0	4.6	0.0	0.0	0.0	7.0	218.0	0.0	482	482	107.0	JBS				
9	24.0	0.0	0.0	9.7	0.0	4.6	0.0	0.0	0.0	7.0	218.0	0.0	482	482	107.0	JBS				
10	24.0	0.0	0.0	9.7	0.0	4.6	0.0	0.0	0.0	7.0	218.0	0.0	482	482	107.0	MAH				
11	24.0	0.0	0.0	9.7	0.0	4.6	0.0	0.0	0.0	7.0	218.0	0.0	482	482	107.0	MAH				
12	24.0	0.0	0.0	9.7	0.0	4.6	0.0	0.0	0.0	7.0	218.0	0.0	482	482	107.0	MAH				
13	24.0	0.0	0.0	9.7	0.0	4.6	0.0	0.0	0.0	7.0	218.0	0.0	482	482	107.0	MAH				
14	24.0	0.0	0.0	9.7	0.0	4.6	0.0	0.0	0.0	7.0	218.0	0.0	482	482	107.0	MAH				
15	24.0	0.0	0.0	9.7	0.0	4.6	0.0	0.0	0.0	7.0	218.0	0.0	516	516	107.0	JBS				
16	24.0	0.0	0.0	9.7	0.0	4.6	0.0	0.0	0.0	7.0	218.0	0.0	516	516	107.0	JBS				
17	24.0	0.0	0.0	9.7	0.0	4.6	0.0	0.0	0.0	7.0	218.0	0.0	516	516	107.0	JBS				
18	24.0	0.0	0.0	9.7	0.0	4.6	0.0	0.0	0.0	7.0	218.0	0.0	516	516	107.0	JBS				
19	24.0	0.0	0.0	9.7	0.0	4.6	0.0	0.0	0.0	7.0	218.0	0.0	516	516	107.0	JBS				
20	24.0	0.0	0.0	9.7	0.0	4.6	0.0	0.0	0.0	7.0	218.0	0.0	516	516	107.0	JBS				
21	24.0	0.0	0.0	9.7	0.0	4.6	0.0	0.0	0.0	7.0	218.0	0.0	516	516	107.0	JBS				
22	24.0	0.0	0.0	9.7	0.0	4.6	0.0	0.0	0.0	7.0	218.0	0.0	516	516	107.0	JBS				
23	24.0	0.0	0.0	9.7	0.0	4.6	0.0	0.0	0.0	7.0	218.0	0.0	516	516	107.0	JBS				
24	24.0	0.0	0.0	9.7	0.0	4.6	0.0	0.0	0.0	7.0	218.0	0.0	516	516	107.0	JBS				
25	24.0	0.0	0.0	9.7	0.0	4.6	0.0	0.0	0.0	7.0	218.0	0.0	516	516	107.0	JBS				
26	24.0	0.0	0.0	9.4	0.0	4.2	0.0	0.0	0.0	7.0	218.0	0.0	516	516	107.0	JBS	48.0	17.53	8.25	0.00
27	24.0	0.0	0.0	9.4	0.0	4.2	0.0	0.0	0.0	7.0	218.0	0.0	516	516	107.0	JBS				
28	24.0	0.0	0.0	9.4	0.0	4.2	0.0	0.0	0.0	7.0	218.0	0.0	516	516	107.0	JBS				
29	24.0	0.0	0.0	9.4	0.0	4.2	0.0	0.0	0.0	7.0	218.0	0.0	516	516	107.0	JBS				
30	24.0	0.0	0.0	9.4	0.0	4.2	0.0	0.0	0.0	7.0	218.0	0.0	516	516	107.0	JBS				
31	24.0	0.0	0.0	9.4	0.0	4.2	0.0	0.0	0.0	7.0	218.0	0.0	516	516	107.0	JBS				

744.0 321.9 150.0 0.0 0.0 0.0

Hours producing load oil 0.0, load oil left to recover 0.0 m3, load water left to recover 0.0 m3

Remarks:

Oil Company Limited / Scurry Rainbow Oil Limited  
Field Data Capture System  
Monthly Well Report

Current Time: 01/04/93 16:03:07

Report Month: Dec/92

Battery: PIERSON 14-9-2-29W1

Well: PIERSON 14-9-2-29

Zone:

Pool: SPEARFISH

Satellite: 14-B SAT

UWI: 00/10-08-002-29W1/0

Oper: Unit: 1

Choke size (mm): 0.0 Well depth (jtf): 0.0

Code: 222

Pump Type: PLUNGER

P R O D U C T I O N															T E S T				
Day	Net Hrs	Load Oil Used (m3)	Load Water Used (m3)	--- Pro-rated ---			Prod Oil (m3)	Prod Water (m3)	--Stroke-- Speed (spm)	Pump Len. (cm)	Pump Eff. (%)	TUP (kPa)	CSP (kPa)	Casing Fluid Level (jtf)	Op.	Hrs. Test (hr)	Oil Prod (m3)	Water Prod (m3)	Gas Prod (E3m3)
				Prod Oil (m3)	Allow. Left (m3)	Prod Water (m3)													
C/O		0.0	0.0												92/11/28	48.0	16.40	0.33	0.00
1	24.0	0.0	0.0	8.8	0.0	0.2	0.0	0.0	125.0	0.0	0.0	585	585	86.0	JBS				
2	24.0	0.0	0.0	8.8	0.0	0.2	0.0	0.0	110.0	0.0	0.0	585	585	92.0	JBS				
3	24.0	0.0	0.0	8.8	0.0	0.2	0.0	0.0	110.0	0.0	0.0	585	585	89.0	JBS				
4	24.0	0.0	0.0	8.8	0.0	0.2	0.0	0.0	110.0	0.0	0.0	585	585	89.0	JBS				
5	24.0	0.0	0.0	5.3	0.0	0.2	0.0	0.0	75.0	0.0	0.0	585	585	75.0	JBS	72.0	14.98	0.48	0.00
6	24.0	0.0	0.0	5.3	0.0	0.2	0.0	0.0	90.0	0.0	0.0	585	585	75.0	JBS				
7	24.0	0.0	0.0	5.3	0.0	0.2	0.0	0.0	90.0	0.0	0.0	585	585	81.0	JBS				
8	24.0	0.0	0.0	5.3	0.0	0.2	0.0	0.0	100.0	0.0	0.0	482	482	83.0	JBS				
9	24.0	0.0	0.0	5.3	0.0	0.2	0.0	0.0	100.0	0.0	0.0	516	516	83.0	JBS				
10	24.0	0.0	0.0	5.3	0.0	0.2	0.0	0.0	100.0	0.0	0.0	516	516	82.0	WAN				
11	24.0	0.0	0.0	5.6	0.0	0.2	0.0	0.0	100.0	0.0	0.0	620	620	90.0	LAN	48.0	10.55	0.38	0.00
12	24.0	0.0	0.0	5.6	0.0	0.2	0.0	0.0	90.0	0.0	0.0	620	620	80.0	LAN				
13	24.0	0.0	0.0	5.9	0.0	0.2	0.0	0.0	90.0	0.0	0.0	620	620	76.0	JBS	24.0	5.48	0.23	0.00
14	24.0	0.0	0.0	5.9	0.0	0.2	0.0	0.0	90.0	0.0	0.0	620	620	76.0	JBS				
15	24.0	0.0	0.0	5.9	0.0	0.2	0.0	0.0	90.0	0.0	0.0	620	620	76.0	JBS				
16	24.0	0.0	0.0	5.9	0.0	0.2	0.0	0.0	90.0	0.0	0.0	516	516	82.0	JBS				
17	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	90.0	0.0	0.0	516	516	82.0	JBS				
18	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	90.0	0.0	0.0	516	516	82.0	JBS				
19	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	90.0	0.0	0.0	516	516	82.0	JBS				
20	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	90.0	0.0	0.0	516	516	82.0	JBS				
21	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	90.0	0.0	0.0	516	516	82.0	JBS				
22	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	90.0	0.0	0.0	516	516	82.0	JBS				
23	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	90.0	0.0	0.0	516	516	82.0	JBS				
24	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	90.0	0.0	0.0	516	516	82.0	JBS				
25	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	90.0	0.0	0.0	516	516	82.0	JBS				
26	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	90.0	0.0	0.0	516	516	82.0	JBS				
27	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	90.0	0.0	0.0	516	516	82.0	JBS				
28	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	90.0	0.0	0.0	516	516	82.0	JBS				
29	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	90.0	0.0	0.0	516	516	82.0	JBS				
30	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	90.0	0.0	0.0	516	516	82.0	JBS				
31	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	90.0	0.0	0.0	516	516	82.0	JBS				

384.0 101.8 2.9 0.0 0.0 0.0

Hours producing load oil 0.0, load oil left to recover 0.0 m3, load water left to recover 0.0 m3

Remarks:

Not Oil Casing With 16.0m3 Of Oil No Returns.

Home Oil Company Limited / Scurry Rainbow Oil Limited  
Field Data Capture System  
Monthly Well Report

Current Time: 01/04/93 16:03:24

Report Month: Dec/92  
Battery: PIERSON 14-B-2-29W1  
Well: PIERSON 14-B-2-29  
Zone:  
Pump Type: PLUNGER

Satellite: 14-B SAT  
UWI: 00/14-08-002-29W1/0  
Oper: Unit: 1

Choke size (mm): 0.0 Well depth (jtf): 0.0  
Code: 226

Pool: SPEARFISH

P R O D U C T I O N														[----- T E S T -----]				
Net Hrs (hr)	Oil Used (m3)	Water Used (m3)	--- Prorated ---				Prod Prod		--Stroke--		Pump Eff. (%)	Casing		Op.	Hrs. Test (hr)	Oil Prod (m3)	Water Prod (m3)	Gas Prod (m3)
			Prod Oil (m3)	Allow. Left (m3)	Prod Water (m3)	Prod Gas (m3)	Load Oil (m3)	Load Water (m3)	Speed (spm)	Len. (cm)		TSP (kPa)	CSP (kPa)					
92/11/07														72.0	15.32	3.29	0.00	
	0.0	0.0													72.0	10.89	0.63	0.00
24.0	0.0	0.0	3.9	0.0	0.2	0.0	0.0	0.0	10.0	100.0	0.0	482	482	108.0	JBS			
24.0	0.0	0.0	3.9	0.0	0.2	0.0	0.0	0.0	10.0	100.0	0.0	482	482	108.0	JBS			
24.0	0.0	0.0	3.9	0.0	0.2	0.0	0.0	0.0	10.0	100.0	0.0	482	482	108.0	JBS			
24.0	0.0	0.0	3.9	0.0	0.2	0.0	0.0	0.0	10.0	100.0	0.0	482	482	108.0	JBS			
24.0	0.0	0.0	3.9	0.0	0.2	0.0	0.0	0.0	10.0	100.0	0.0	482	482	108.0	JBS			
24.0	0.0	0.0	3.9	0.0	0.2	0.0	0.0	0.0	10.0	100.0	0.0	482	482	108.0	JBS			
24.0	0.0	0.0	3.9	0.0	0.2	0.0	0.0	0.0	10.0	100.0	0.0	482	482	108.0	JBS			
24.0	0.0	0.0	3.9	0.0	0.2	0.0	0.0	0.0	8.0	100.0	0.0	482	482	108.0	LAN			
24.0	0.0	0.0	3.9	0.0	0.2	0.0	0.0	0.0	8.0	100.0	0.0	482	482	108.0	LAN			
24.0	0.0	0.0	3.9	0.0	0.2	0.0	0.0	0.0	8.0	100.0	0.0	482	482	108.0	LAN			
24.0	0.0	0.0	3.9	0.0	0.2	0.0	0.0	0.0	8.0	100.0	0.0	482	482	108.0	LAN			
24.0	0.0	0.0	3.9	0.0	0.2	0.0	0.0	0.0	8.0	100.0	0.0	482	482	108.0	LAN			
24.0	0.0	0.0	3.9	0.0	0.2	0.0	0.0	0.0	8.0	100.0	0.0	482	482	108.0	LAN			
24.0	0.0	0.0	3.9	0.0	0.2	0.0	0.0	0.0	8.0	100.0	0.0	482	482	108.0	LAN			
24.0	0.0	0.0	3.9	0.0	0.2	0.0	0.0	0.0	8.0	100.0	0.0	482	482	108.0	LAN			
24.0	0.0	0.0	3.9	0.0	0.2	0.0	0.0	0.0	8.0	100.0	0.0	482	482	108.0	JBS			
24.0	0.0	0.0	3.9	0.0	0.2	0.0	0.0	0.0	8.0	100.0	0.0	482	482	108.0	JBS			
24.0	0.0	0.0	3.9	0.0	0.2	0.0	0.0	0.0	8.0	100.0	0.0	482	482	108.0	JBS			
24.0	0.0	0.0	3.9	0.0	0.2	0.0	0.0	0.0	8.0	100.0	0.0	482	482	108.0	JBS			
24.0	0.0	0.0	3.9	0.0	0.2	0.0	0.0	0.0	8.0	100.0	0.0	482	482	108.0	JBS			
24.0	0.0	0.0	3.9	0.0	0.2	0.0	0.0	0.0	8.0	100.0	0.0	482	482	108.0	JBS			
24.0	0.0	0.0	3.9	0.0	0.2	0.0	0.0	0.0	8.0	100.0	0.0	482	482	108.0	JBS			
24.0	0.0	0.0	3.9	0.0	0.2	0.0	0.0	0.0	8.0	100.0	0.0	482	482	108.0	JBS			
24.0	0.0	0.0	3.9	0.0	0.2	0.0	0.0	0.0	8.0	100.0	0.0	482	482	108.0	JBS			
24.0	0.0	0.0	3.9	0.0	0.2	0.0	0.0	0.0	8.0	100.0	0.0	482	482	108.0	JBS			
24.0	0.0	0.0	3.9	0.0	0.2	0.0	0.0	0.0	8.0	100.0	0.0	482	482	108.0	JBS			
24.0	0.0	0.0	3.9	0.0	0.2	0.0	0.0	0.0	8.0	100.0	0.0	482	482	108.0	JBS			
24.0	0.0	0.0	3.9	0.0	0.2	0.0	0.0	0.0	8.0	100.0	0.0	482	482	108.0	JBS			
24.0	0.0	0.0	3.9	0.0	0.2	0.0	0.0	0.0	8.0	100.0	0.0	482	482	108.0	JBS			
24.0	0.0	0.0	3.9	0.0	0.2	0.0	0.0	0.0	8.0	100.0	0.0	482	482	108.0	JBS			
24.0	0.0	0.0	3.9	0.0	0.2	0.0	0.0	0.0	8.0	100.0	0.0	482	482	108.0	JBS			
24.0	0.0	0.0	3.9	0.0	0.2	0.0	0.0	0.0	8.0	100.0	0.0	482	482	108.0	JBS			
24.0	0.0	0.0	3.9	0.0	0.2	0.0	0.0	0.0	8.0	100.0	0.0	482	482	108.0	JBS			
24.0	0.0	0.0	3.9	0.0	0.2	0.0	0.0	0.0	8.0	100.0	0.0	482	482	108.0	JBS			
24.0	0.0	0.0	3.9	0.0	0.2	0.0	0.0	0.0	8.0	100.0	0.0	482	482	108.0	JBS			
24.0	0.0	0.0	3.9	0.0	0.2	0.0	0.0	0.0	8.0	100.0	0.0	482	482	108.0	JBS			
24.0	0.0	0.0	3.9	0.0	0.2	0.0	0.0	0.0	8.0	100.0	0.0	482	482	108.0	JBS			
24.0	0.0	0.0	3.9	0.0	0.2	0.0	0.0	0.0	8.0	100.0	0.0	482	482	108.0	JBS			
24.0	0.0	0.0	3.9	0.0	0.2	0.0	0.0	0.0	8.0	100.0	0.0	482	482	108.0	JBS			
24.0	0.0	0.0	3.9	0.0	0.2	0.0	0.0	0.0	8.0	100.0	0.0	482	482	108.0	JBS			
24.0	0.0	0.0	3.9	0.0	0.2	0.0	0.0	0.0	8.0	100.0	0.0	482	482	108.0	JBS			
24.0	0.0	0.0	3.9	0.0	0.2	0.0	0.0	0.0	8.0	100.0	0.0	482	482	108.0	JBS			
24.0	0.0	0.0	3.9	0.0	0.2	0.0	0.0	0.0	8.0	100.0	0.0	482	482	108.0	JBS			
24.0	0.0	0.0	3.9	0.0	0.2	0.0	0.0	0.0	8.0	100.0	0.0	482	482	108.0	JBS			
24.0	0.0	0.0	3.9	0.0	0.2	0.0	0.0	0.0	8.0	100.0	0.0	482	482	108.0	JBS			
24.0	0.0	0.0	3.9	0.0	0.2	0.0	0.0	0.0	8.0	100.0	0.0	482	482	108.0	JBS			
24.0	0.0	0.0	3.9	0.0	0.2	0.0	0.0	0.0	8.0	100.0	0.0	482	482	108.0	JBS			
24.0	0.0	0.0	3.9	0.0	0.2	0.0	0.0	0.0	8.0	100.0	0.0	482	482	108.0	JBS			
24.0	0.0	0.0	3.9	0.0	0.2	0.0	0.0	0.0	8.0	100.0	0.0	482	482	108.0	JBS			
24.0	0.0	0.0	3.9	0.0														

744.0 120.3 6.6 0.0 0.0 0.0

Hours producing load oil 0.0, load oil left to recover 0.0 m3, load water left to recover 0.0 m3

Remarks:

4 INCH SHIVE installed on 14-B jack DEC.8

# Home Oil Company Limited / Scurry Rainbow Oil Limited

## Field Data Capture System

### Monthly Well Report

Report Month: Dec/92

Battery: PIERSON 14-9-2-29W1

Well: PIERSON 2-9-2-29

Zone:

Pump Type: PLUNGER

Satellite: 4-9 SAT

Unit: 00/02-09-002-29W1/0

Open: Unit: 1

Choke size (mm): 0.0 Well depth (jtf): 0.0

Code: 230

Current Time: 01/04/93 16:03:40

P R O D U C T I O N																	T E S T			
Day	Load			--- Perated ---				Prod Prod		---Stroke---	Pump	Casing			Op.	Hrs. Test	Oil Prod	Water Prod	Gas Prod	
	Net	Oil	Water	Prod	Allow.	Prod	Prod	Load	Load			Fluid								
	Hrs	Used	Used	Oil	Left	Water	Gas	Oil	Water			Level								
	(hr)	(m3)	(m3)	(m3)	(m3)	(m3)	(E3m3)	(m3)	(m3)	Speed	Len.	Eff.	TBP	CSP	(jtf)	(hr)	(m3)	(m3)	(E3m3)	
										(spm)	(cm)	(%)	(kPa)	(kPa)						
C/O		0.0	0.0												92/11/11	48.0	9.21	1.62	0.00	
1	24.0	0.0	0.0	5.2	0.0	0.7	0.0	0.0	0.0	5.5	152.0	0.0	585	585	107.0	JBS	24.0	4.85	0.66	0.00
2	9.0	0.0	0.0	1.9	0.0	0.3	0.0	0.0	0.0	5.5	152.0	0.0	585	585	107.0	JBS				
3	24.0	0.0	0.0	5.2	0.0	0.7	0.0	0.0	0.0	5.5	152.0	0.0	585	585	107.0	JBS				
4	24.0	0.0	0.0	5.2	0.0	0.7	0.0	0.0	0.0	5.5	152.0	0.0	585	585	107.0	JBS				
5	24.0	0.0	0.0	5.2	0.0	0.7	0.0	0.0	0.0	5.5	152.0	0.0	585	585	107.0	JBS				
6	24.0	0.0	0.0	5.2	0.0	0.7	0.0	0.0	0.0	5.5	152.0	0.0	585	585	107.0	JBS				
7	24.0	0.0	0.0	5.2	0.0	0.7	0.0	0.0	0.0	5.5	152.0	0.0	585	585	107.0	JBS				
8	24.0	0.0	0.0	5.2	0.0	0.7	0.0	0.0	0.0	5.5	152.0	0.0	585	585	107.0	JBS				
9	24.0	0.0	0.0	5.2	0.0	0.7	0.0	0.0	0.0	5.5	152.0	0.0	585	585	107.0	JBS				
10	24.0	0.0	0.0	5.2	0.0	0.7	0.0	0.0	0.0	5.5	152.0	0.0	482	482	107.0	WAN				
11	24.0	0.0	0.0	5.2	0.0	0.7	0.0	0.0	0.0	5.5	152.0	0.0	482	482	107.0	WAN				
12	24.0	0.0	0.0	5.2	0.0	0.7	0.0	0.0	0.0	5.5	152.0	0.0	482	482	107.0	WAN				
13	24.0	0.0	0.0	5.2	0.0	0.7	0.0	0.0	0.0	5.5	152.0	0.0	482	482	107.0	WAN				
14	24.0	0.0	0.0	5.2	0.0	0.7	0.0	0.0	0.0	5.5	152.0	0.0	482	482	107.0	WAN				
15	24.0	0.0	0.0	5.2	0.0	0.7	0.0	0.0	0.0	5.5	152.0	0.0	516	516	107.0	JBS				
16	24.0	0.0	0.0	5.2	0.0	0.7	0.0	0.0	0.0	5.5	152.0	0.0	516	516	107.0	JBS				
17	24.0	0.0	0.0	5.2	0.0	0.7	0.0	0.0	0.0	5.5	152.0	0.0	516	516	107.0	JBS				
18	24.0	0.0	0.0	5.2	0.0	0.7	0.0	0.0	0.0	5.5	152.0	0.0	516	516	107.0	JBS				
19	24.0	0.0	0.0	5.2	0.0	0.7	0.0	0.0	0.0	5.5	152.0	0.0	516	516	107.0	JBS				
20	24.0	0.0	0.0	5.2	0.0	0.7	0.0	0.0	0.0	5.5	152.0	0.0	516	516	107.0	JBS				
21	24.0	0.0	0.0	5.2	0.0	0.7	0.0	0.0	0.0	5.5	152.0	0.0	516	516	107.0	JBS				
22	24.0	0.0	0.0	5.2	0.0	0.7	0.0	0.0	0.0	5.5	152.0	0.0	516	516	107.0	JBS				
23	24.0	0.0	0.0	5.2	0.0	0.7	0.0	0.0	0.0	5.5	152.0	0.0	516	516	107.0	JBS				
24	24.0	0.0	0.0	5.2	0.0	0.7	0.0	0.0	0.0	5.5	152.0	0.0	516	516	107.0	JBS				
25	24.0	0.0	0.0	5.2	0.0	0.7	0.0	0.0	0.0	5.5	152.0	0.0	516	516	107.0	JBS				
26	4.0	0.0	0.0	0.9	0.0	0.1	0.0	0.0	0.0	5.5	152.0	0.0	516	516	107.0	LAN				
27	24.0	0.0	0.0	5.2	0.0	0.7	0.0	0.0	0.0	5.5	152.0	0.0	516	516	107.0	LAN				
28	24.0	0.0	0.0	5.2	0.0	0.7	0.0	0.0	0.0	5.5	152.0	0.0	516	516	107.0	LAN				
29	24.0	0.0	0.0	5.2	0.0	0.7	0.0	0.0	0.0	5.5	152.0	0.0	516	516	107.0	LAN				
30	24.0	0.0	0.0	5.2	0.0	0.7	0.0	0.0	0.0	5.5	152.0	0.0	516	516	107.0	LAN				
31	24.0	0.0	0.0	5.2	0.0	0.7	0.0	0.0	0.0	5.5	152.0	0.0	516	516	107.0	LAN				

709.0 153.4 19.7 0.0 0.0 0.0

Hours producing load oil 0.0, load oil left to recover 0.0 m3, load water left to recover 0.0 m3

Remarks:

Dec. 26 2-9 down 20 hrs. shive came off motor

- JOHN TUREAY (403) 232-7541

NOV 30/92

- kh mapping

khaven - 15 Ld.m

not direct correlation between kh & productivity

6-4 38.7 md.m

6-7 50.4 md.m

2-30 93.1 md.m

4-31 28.9 md.m

early well, large volume  
fract jobs

- need development plans - 1993

- kh mapping

supersizing

NEIL OER - a hdm exploration in MB.  
Managers Exploration

- no more Ek <sup>Mississippian</sup> producing / non-producing properties
- HOC not extremely happy with deeper properties in Winnipegosis

- petrophysical modelling is <sup>more</sup> complicated than  
oil well, the rest

- HOC visit mid-January '93



Revised Nov 15/92

underlined "a" are  
Lands owned by 2 companies (A & B)

Twp 02

SASKATCHEWAN

MANIT

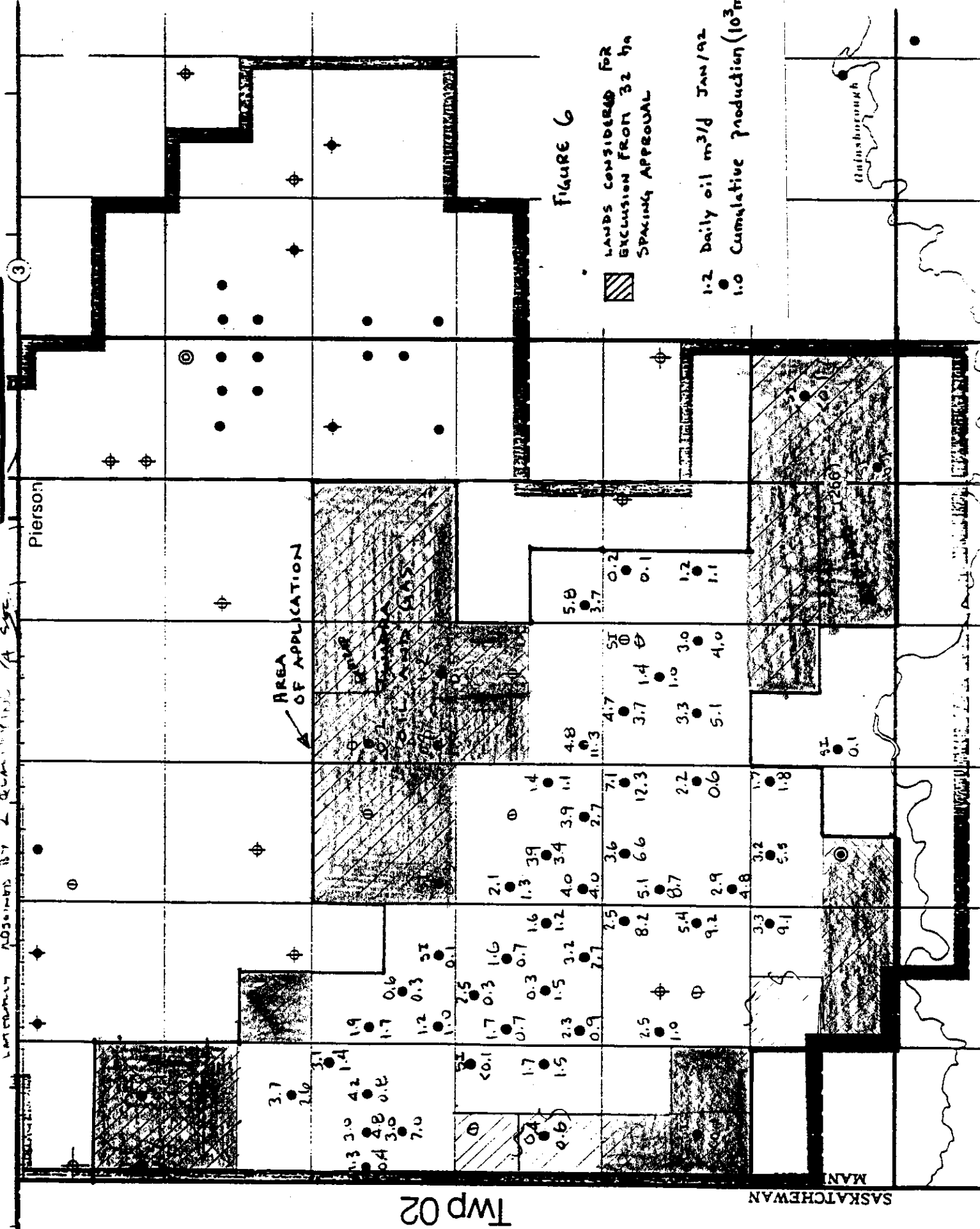
FIGURE 6

LANDS CONSIDERED FOR  
EXCLUSION FROM 32 ha  
SPACING APPROVAL

1.2 Daily oil m<sup>3</sup>/d Jan/92  
1.0 Cumulative production (10<sup>3</sup>m<sup>3</sup>)

(Inclusion)

AREA OF APPLICATION



**LAm B POOL  
07 29B**

**PIERSON FIELD**

OIL WATER	Cum. Prod. Dec. 31/91 m <sup>3</sup>	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	AUG. Daily m <sup>3</sup>	1992 Y.T.D. m <sup>3</sup>	Cum. Total m <sup>3</sup>
NON-UNIT PREVIOUS PRODUCERS	358.5 1 330.5															358.5 1 330.5
LAm B POOL:	13 354.1 54 587.9		165.2 483.8		222.2 407.4		177.9 386.4		173.9 424.5							14 915.6 57 954.3
TOTAL OIL		216.2		218.3		194.8		193.0							1 561.5	
TOTAL WATER		395.1		429.9		413.7		425.6							3 366.4	

**LAm C POOL  
07 29C**

**HOME OIL COMPANY LIMITED**

14-04-02-29	5 377.8	100.5	88.8	91.8	88.7	88.2	88.2	90.5	89.2					2.88	725.9	6 103.7
Prov.	1 753.1	22.3	18.1	14.2	12.8	12.5	9.5	11.9	14.4						115.7	1 868.8
16-04-02-29	1 704.4	52.1	44.0	43.9	66.4	47.2	57.2	61.7	32.7					1.05	405.2	2 109.6
Prvw	651.6	3.9	0.3	0.4	0.6	6.1	12.3	2.4	10.0						36.0	687.6
16-05-02-29	8 990.5	102.4	82.2	98.2	89.5	89.6	90.6	90.1	80.6					2.60	723.2	9 713.7
	9 381.2	125.5	116.8	130.7	122.3	121.2	118.1	126.0	110.3						970.9	10 352.1
06-07-02-29	41.6	—	—	—	—	—	—	—	—						—	41.6
	699.8	—	—	—	—	—	—	—	—						—	699.8
06-08-02-29	—	—	—	—	—	227.3	277.4	214.2	172.8					5.96	891.7	891.7
Prvw (05/01)	—	—	—	—	—	39.9	104.6	85.8	83.0						313.3	313.3
08-08-02-29	9 039.5	168.4	155.0	168.8	155.9	151.2	163.1	195.8	189.6					6.32	1 347.8	10 387.3
Prvw	17 272.6	390.7	367.6	383.6	349.2	385.1	341.5	325.6	330.0						2 873.3	20 145.9
12-08-02-29	917.2	78.4	88.8	85.6	80.1	80.1	78.3	82.3	80.5					2.60	654.1	1 571.3
	272.6	32.3	23.9	17.7	16.8	16.8	18.7	14.8	16.4						157.4	430.0
16-08-02-29	8 160.6	78.4	60.0	62.6	63.6	51.8	70.5	73.9	67.3					2.17	528.1	8 688.7
	1 453.0	2.3	2.3	2.2	1.0	0.5	7.2	1.4	1.1						18.0	1 471.0
04-09-02-29	4 753.4	88.2	65.7	78.2	72.1	73.5	72.4	64.4	74.3					2.48	588.8	5 342.2
	14 364.5	207.2	205.3	200.5	190.8	197.1	184.2	208.3	194.0						1 587.4	15 951.9
08-09-02-29	567.9	67.6	60.0	63.2	57.6	56.0	48.8	44.4	44.6					1.44	442.2	1 010.1
	152.3	11.3	6.3	4.1	7.9	8.0	12.6	17.6	12.7						80.5	232.8
12-09-02-29	8 557.8	158.0	145.5	156.4	152.2	149.4	149.1	161.7	148.8					4.80	1 221.1	9 778.9
	1 652.1	25.2	23.0	16.9	23.3	27.7	25.1	26.7	28.7						196.6	1 848.7
14-09-02-29	6 493.1	110.0	108.9	115.1	107.7	97.9	83.8	77.0	93.4					3.01	793.8	7 286.9
	58 769.5	1 439.5	1 373.0	1 452.1	1 384.4	1 462.4	1 389.5	1 446.5	1 379.0						11 326.4	70 095.9
16-09-02-29	12 069.8	213.4	192.5	203.8	219.2	233.1	173.3	194.6	206.2					6.65	1 636.1	13 705.9
	1 402.1	23.1	25.6	21.5	26.4	29.1	23.5	46.2	39.3						234.7	1 636.8
06-10-02-29	5 017.7	101.2	83.8	99.4	93.1	116.1	115.6	114.7	114.6					3.82	838.5	5 856.2
	26 829.6	769.8	612.1	800.5	775.1	790.0	743.1	775.6	767.1						6 033.3	32 862.9
08-10-02-29	3 921.7	94.0	79.5	67.3	63.4	50.6	85.6	54.2	33.0					1.06	527.6	4 449.3
	39 449.4	881.5	826.7	898.1	862.0	917.2	887.4	928.6	964.0						7 165.5	46 614.9
10-10-02-29	955.8	43.9	45.5	50.6	46.8	43.5	39.7	41.2	41.0					1.32	352.2	1 308.0
Prvw	5 540.7	287.7	250.9	264.9	247.4	268.1	250.7	262.2	271.2						2 103.1	7 643.8
14-10-02-29	3 544.9	140.4	116.4	114.0	122.6	118.3	113.2	114.8	117.6					3.79	957.3	4 502.2
	6 723.5	248.2	225.4	229.9	224.6	228.2	201.2	210.2	212.8						1 780.5	8 504.0
16-10-02-29	—	—	—	—	—	—	—	—	—						—	—
Prvw	251.1	—	—	—	—	—	—	—	—						—	251.1
06-11-02-29	1 012.1	37.9	39.9	35.6	40.2	49.9	43.1	30.0	44.6					1.44	321.2	1 333.3
Prvw	363.9	10.2	8.6	4.5	5.0	6.3	5.4	2.4	1.8						44.2	408.1
14-11-02-29	120.8	7.1	7.2	19.1	5.9	—	—	37.2	17.0					0.55	93.5	214.3
Prvw	269.0	25.1	25.2	29.0	6.1	—	—	27.4	31.4						144.2	413.2
04-14-02-29	3 533.1	180.5	150.8	154.4	160.4	153.9	143.9	145.7	145.8					5.03	1 235.4	4 768.5
Prvw	370.9	2.9	1.5	9.1	2.4	6.7	11.8	13.6	9.9						57.9	428.8

**LAM C POOL  
07 29C**

**PIERSON FIELD**

OIL WATER	Cum. Prod. Dec. 31/91 m <sup>3</sup>	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	AUG. Daily m <sup>3</sup>	1992 Y.T.D. m <sup>3</sup>	Cum. Total m <sup>3</sup>
<b>HOME OIL COMPANY LIMITED (Cont.)</b>																
04-15-02-29	11 154.2 920.5	149.4 3.8	135.3 4.7	135.1 5.5	132.9 6.4	134.3 3.7	130.1 3.8	129.4 5.5	121.8 6.3					3.93	1 068.3 39.7	12 222.5 960.2
02-16-02-29 Prvw	2 589.8 103.6	121.9 1.0	118.1 1.2	117.0 0.9	109.7 0.4	103.6 0.7	107.9 0.7	136.7 0.6	123.8 0.6					3.99	938.7 6.1	3 528.5 109.7
04-16-02-29 Prvw	3 917.8 116.9	123.8 2.8	112.9 1.3	117.5 0.6	126.2 1.2	113.4 1.1	116.5 0.6	119.3 0.5	120.2 0.5					3.88	949.8 8.6	4 867.6 125.5
06-16-02-29 Prvw	3 295.1 315.9	120.7 2.1	113.4 4.4	112.8 3.9	105.4 3.4	102.7 3.2	112.9 2.4	117.9 2.3	103.8 1.0					3.35	889.6 22.7	4 184.7 338.6
08-16-02-29 Prvw	1 097.2 158.4	43.3 1.2	39.4 1.2	34.8 3.2	34.7 2.8	32.8 1.2	37.6 1.5	40.2 0.4	41.2 0.4					1.33	304.0 11.9	1 401.2 170.3
10-16-02-29 Prvw (04/15)	— —	— —	— —	— —	3.0 16.1	31.9 0.4	31.9 0.4	32.1 0.3	16.1 0.1					0.52	115.0 17.3	115.0 17.3
12-16-02-29 Prvw	1 271.8 15.2	64.5 0.3	52.8 4.0	53.8 5.0	53.2 3.3	55.0 0.5	54.4 0.5	53.1 0.6	56.1 0.5					1.81	442.9 14.7	1 714.7 29.9
02-17-02-29	2 558.9 44.4	98.9 1.0	89.3 0.9	91.8 0.9	89.0 1.1	89.9 0.6	88.6 0.4	90.2 0.4	91.4 0.5					2.95	729.1 5.8	3 288.0 50.2
04-17-02-29	836.5 265.1	71.1 4.6	69.1 3.7	63.3 3.8	60.3 4.2	61.0 2.3	59.9 4.5	60.6 3.7	60.7 3.3					1.96	506.0 30.1	1 342.5 295.2
06-17-02-29	1 494.4 9 317.4	8.8 188.5	15.5 174.6	34.0 168.6	15.7 86.6	— —	— —	15.6 209.2	18.9 176.5					0.61	108.5 1 004.0	1 602.9 10 321.4
08-17-02-29	1 129.6 51.6	50.2 0.3	45.2 0.2	44.4 0.2	45.2 0.3	45.4 0.4	43.3 0.4	41.3 0.2	43.9 0.2					1.42	358.9 2.2	1 488.5 53.8
10-17-02-29	688.4 125.2	48.6 6.6	46.8 2.4	46.4 2.0	44.5 2.5	37.2 1.8	40.6 1.1	44.7 1.2	42.8 4.3					1.38	351.6 21.9	1 040.0 147.1
12-17-02-29	628.6 229.8	53.8 4.7	47.8 2.1	48.8 1.2	46.1 1.1	45.3 5.2	44.8 4.2	45.2 3.9	42.7 3.4					1.38	374.5 25.8	1 003.1 255.6
06-18-02-29	551.7 583.3	12.2 19.2	11.0 18.3	16.2 14.4	19.0 10.8	19.1 11.2	18.6 10.7	17.2 11.6	16.2 12.7					0.52	129.5 108.9	681.2 692.2
08-18-02-29 Prvw	1 436.4 203.3	52.8 7.6	43.2 6.1	56.7 4.1	55.3 9.1	53.1 6.3	51.2 5.8	54.6 6.2	55.7 5.5					1.80	422.6 50.7	1 859.0 254.0
14-18-02-29 Prvw (04/77)	— —	— —	— —	— —	12.0 —	118.1 —	159.6 45.4	103.9 25.6	85.0 25.1					2.74	478.6 96.1	478.6 96.1
16-18-02-29	8.8 38.8	— —	— —	— —	— —	— —	— —	— —	— —						— —	8.8 38.8
06-19-02-29	6 957.2 325.5	92.0 1.7	79.3 1.5	84.0 1.5	112.1 1.6	131.3 1.0	120.4 0.6	131.6 1.1	138.1 0.7					4.45	888.8 9.7	7 846.0 335.2
10-19-02-29	646.8 488.6	125.2 62.0	103.0 55.1	108.8 72.1	98.5 70.3	96.6 76.5	81.3 82.7	75.3 83.2	86.1 84.4					2.78	774.8 586.3	1 421.6 1 074.9
11-19-02-29	4 752.7 317.2	93.6 0.7	119.2 1.0	161.4 1.5	148.4 1.4	168.0 0.8	166.5 0.7	170.8 0.7	173.8 0.7					5.61	1 201.7 7.5	5 954.4 324.7
12-19-02-29	363.0 4 624.6	38.7 347.6	31.9 330.8	16.7 357.8	18.1 328.0	18.0 342.1	13.7 324.2	8.8 331.8	14.3 327.6					0.46	160.2 2 689.9	523.2 7 314.5
16-19-02-29	1 299.9 2 602.3	96.6 129.1	87.2 120.8	77.5 126.2	58.5 130.2	41.3 145.3	33.7 147.0	39.6 145.7	47.5 134.6					1.53	481.9 1 078.9	1 781.8 3 681.2
02-20-02-29	122.6 203.2	— —	— —	— —	— —	— —	— —	— —	— —						— —	122.6 203.2
04-20-02-29 Prvw	970.0 224.5	38.5 7.3	37.2 4.6	38.5 4.9	34.1 5.6	30.6 5.8	28.3 9.6	27.0 9.3	23.0 10.2					0.74	257.2 57.3	1 227.2 281.8

**LAm C POOL  
07 29C**

**PIERSON FIELD**

OIL WATER	Cum. Prod. Dec. 31/91 m <sup>3</sup>	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	AUG. Daily m <sup>3</sup>	1992 Y.T.D. m <sup>3</sup>	Cum. Total m <sup>3</sup>
<b>HOME OIL COMPANY LIMITED (Cont.)</b>																
06-20-02-29	313.7	17.5	12.5	13.0	12.7	12.8	12.6	13.0	13.4					0.43	107.5	421.2
Prov	131.3	1.6	2.7	2.9	3.0	6.1	5.7	5.9	6.0						33.9	165.2
12-20-02-29	1 599.0	59.7	58.5	60.7	69.5	72.1	72.3	69.0	74.0					2.47	535.8	2 134.8
Prov	290.3	1.7	6.8	7.3	1.5	0.8	0.9	15.0	3.0						37.0	327.3
04-21-02-29	345.1	—	—	—	—	—	—	—	—						—	345.1
	13 355.4	—	—	—	—	—	—	—	—						—	13 355.4
02-30-02-29	2 488.1	114.4	110.4	112.2	96.4	99.9	91.2	92.7	100.1					3.23	817.3	3 305.4
	148.3	3.2	2.3	2.2	2.8	1.0	0.5	0.4	1.0						13.4	161.7
	137 297.0		3 193.5		3 285.9		3 611.7		3 504.2							164 973.5
	222 823.1		4 863.3		4 951.8		5 000.7		5 286.2							264 042.4
TOTAL OIL		3 518.6		3 353.4		3 591.0		3 618.2							27 676.5	
TOTAL WATER		5 307.3		5 270.6		5 140.9		5 398.5							41 219.3	

**T.D.L. PETROLEUMS INC.**

05-03-02-29	71.0	—	—	—	—	—	—	—	—						—	71.0
	473.3	—	—	—	—	—	—	—	—						—	473.3

**TUNDRA OIL AND GAS LTD.**

14-17-02-29 <sup>1</sup>	219.8	39.7	58.8	53.8	47.7	50.7	44.0	45.6	46.4					1.50	386.7	606.5
c	151.4	149.3	90.3	72.5	64.6	—	50.8	45.0	39.2						511.7	663.1
02-22-02-29	491.4	35.4	36.0	30.0	29.1	28.2	29.4	30.6	27.8					0.90	246.5	737.9
Prov	286.4	16.5	11.5	19.0	15.9	17.4	12.6	12.6	14.1						119.6	406.0
04-22-02-29	1 010.1	23.6	25.8	26.3	24.3	24.5	25.7	20.9	24.1					0.78	195.2	1 205.3
Prov. c	346.3	15.9	10.2	11.5	11.8	11.3	7.9	11.6	9.4						89.6	435.9
12-22-02-29	216.1	—	20.2	23.7	10.1	1.3	—	—	—						55.3	271.4
Prov	237.1	—	8.1	11.5	14.2	2.2	—	—	—						36.0	273.1
	1 937.4		140.8		111.2		99.1		98.3							2 821.1
	1 021.2		120.1		106.5		71.3		62.7							1 778.1
TOTAL OIL		98.7		133.8		104.7		97.1							883.7	
TOTAL WATER		181.7		114.5		30.9		69.2							756.9	

NON-UNIT PREVIOUS PRODUCERS	115.0															115.0
	827.8															827.8
LAm C	139 420.4		3 334.3		3 397.1		3 710.8		3 602.5							167 980.6
POOL :	225 145.4		4 983.4		5 058.3		5 072.0		5 348.9							267 121.6
TOTAL OIL		3 617.3		3 487.2		3 695.7		3 715.3							28 560.2	
TOTAL WATER		5 489.0		5 385.1		5 171.8		5 467.7							41 976.2	

**LAm E POOL  
07 29E**

**HOME OIL COMPANY LIMITED**

04-01-02-29	84.8	—	—	—	—	—	—	—	—						—	84.8
	1 363.4	—	—	—	—	—	—	—	—						—	1 363.4
10-01-02-29	22.0	—	—	—	—	—	—	—	—						—	22.0
	373.0	—	—	—	—	—	—	—	—						—	373.0
	106.8		—		—		—		—							106.8
	1 736.4		—		—		—		—							1 736.4
TOTAL OIL		—		—		—		—							—	
TOTAL WATER		—		—		—		—							—	

<sup>1</sup> - COMMINGLED WITH 07 421 - January 11, 1992

**LAm E POOL  
07 29E**

**PIERSON FIELD**

OIL WATER	Cum. Prod. Dec. 31/91 m <sup>3</sup>	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	AUG. Daily m <sup>3</sup>	1992 Y.T.D. m <sup>3</sup>	Cum. Total m <sup>3</sup>
NON-UNIT PREVIOUS PRODUCERS	—															—
LAm E POOL :	106.8 1 736.4		—	—	—	—	—	—	—							106.8 1 736.4
TOTAL OIL		—		—		—		—							—	
TOTAL WATER		—		—		—		—							—	

**LAm G POOL  
07 29G**

**HOME OIL COMPANY LIMITED**

02-31-02-29	20.0 62.1	— —	— —	— —	— —	— —	— —	— —	— —						— —	20.0 62.1
04-31-02-29	775.1 261.4	33.6 14.5	52.5 11.9	59.8 4.4	45.1 3.3	60.2 4.4	45.2 3.3	52.5 12.3	36.5 12.0					1.18	385.4 66.1	1 160.5 327.5
	795.1 323.5		52.5 11.9		45.1 3.3		45.2 3.3		36.5 12.0							1 180.5 389.6
TOTAL OIL		33.6		59.8		60.2		52.5							385.4	
TOTAL WATER		14.5		4.4		4.4		12.3							66.1	
NON-UNIT PREVIOUS PRODUCERS	—															—
LAm G POOL :	795.1 323.5		52.5 11.9		45.1 3.3		45.2 3.3		36.5 12.0							1 180.5 389.6
TOTAL OIL		33.6		59.8		60.2		52.5							385.4	
TOTAL WATER		14.5		4.4		4.4		12.3							66.1	

**LAm H POOL  
07 29H**

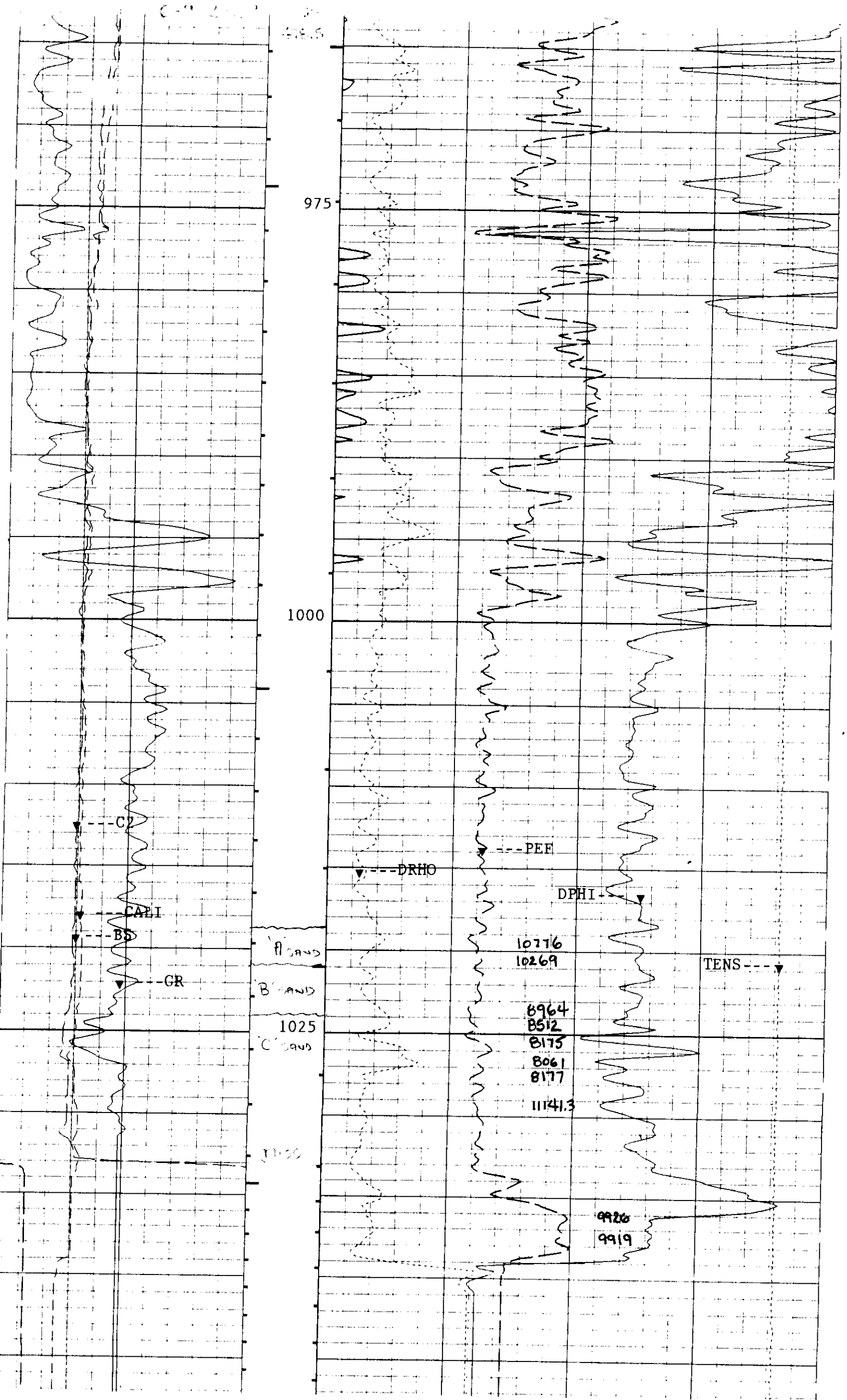
**TUNDRA OIL AND GAS LTD.**

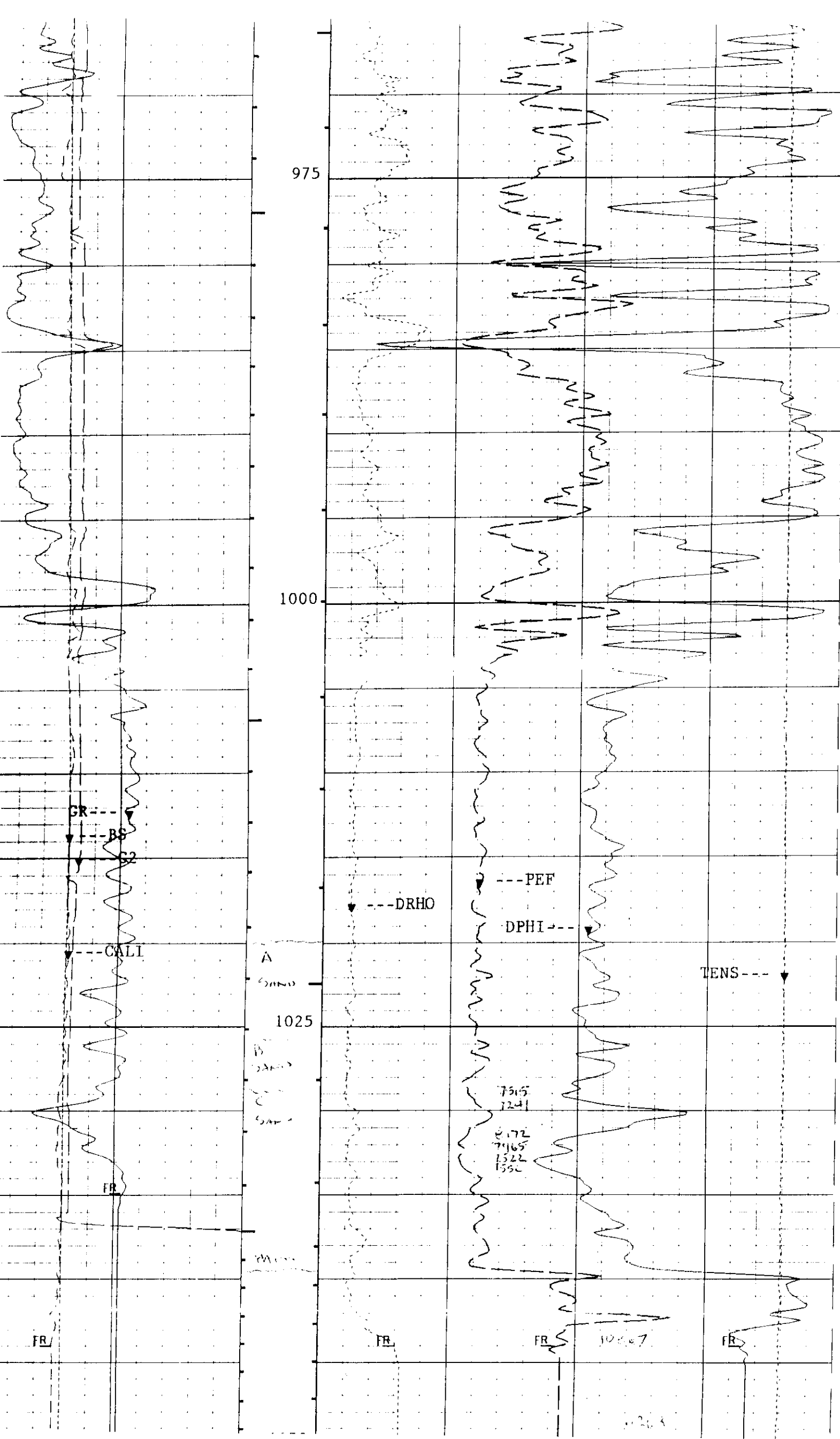
04-20-02-28	394.8	25.2	23.1	22.6	22.6	22.3	23.1	15.3	34.4					1.11	188.6	583.4
Prov.	189.6	11.1	10.2	11.1	9.6	9.2	5.2	5.1	0.3						61.8	251.4
LAm H POOL :	394.8 189.6		23.1 10.2		22.6 9.6		23.1 5.2		34.4 0.3							583.4 251.4
TOTAL OIL		25.2		22.6		22.3		15.3							188.6	
TOTAL WATER		11.1		11.1		9.2		5.1							61.8	

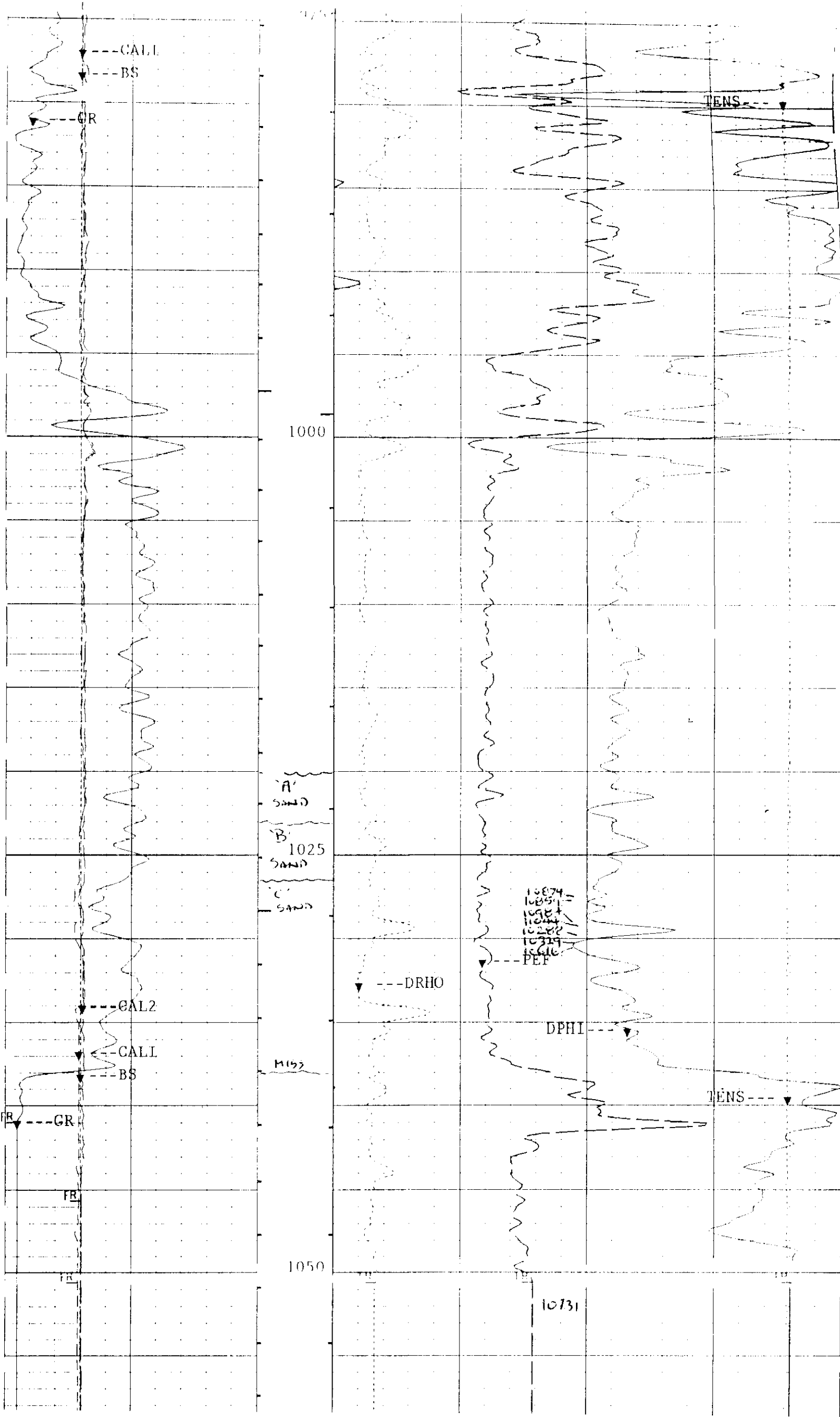
**MISSION CANYON 3b B POOL  
07 42B**

**TUNDRA OIL AND GAS LTD.**

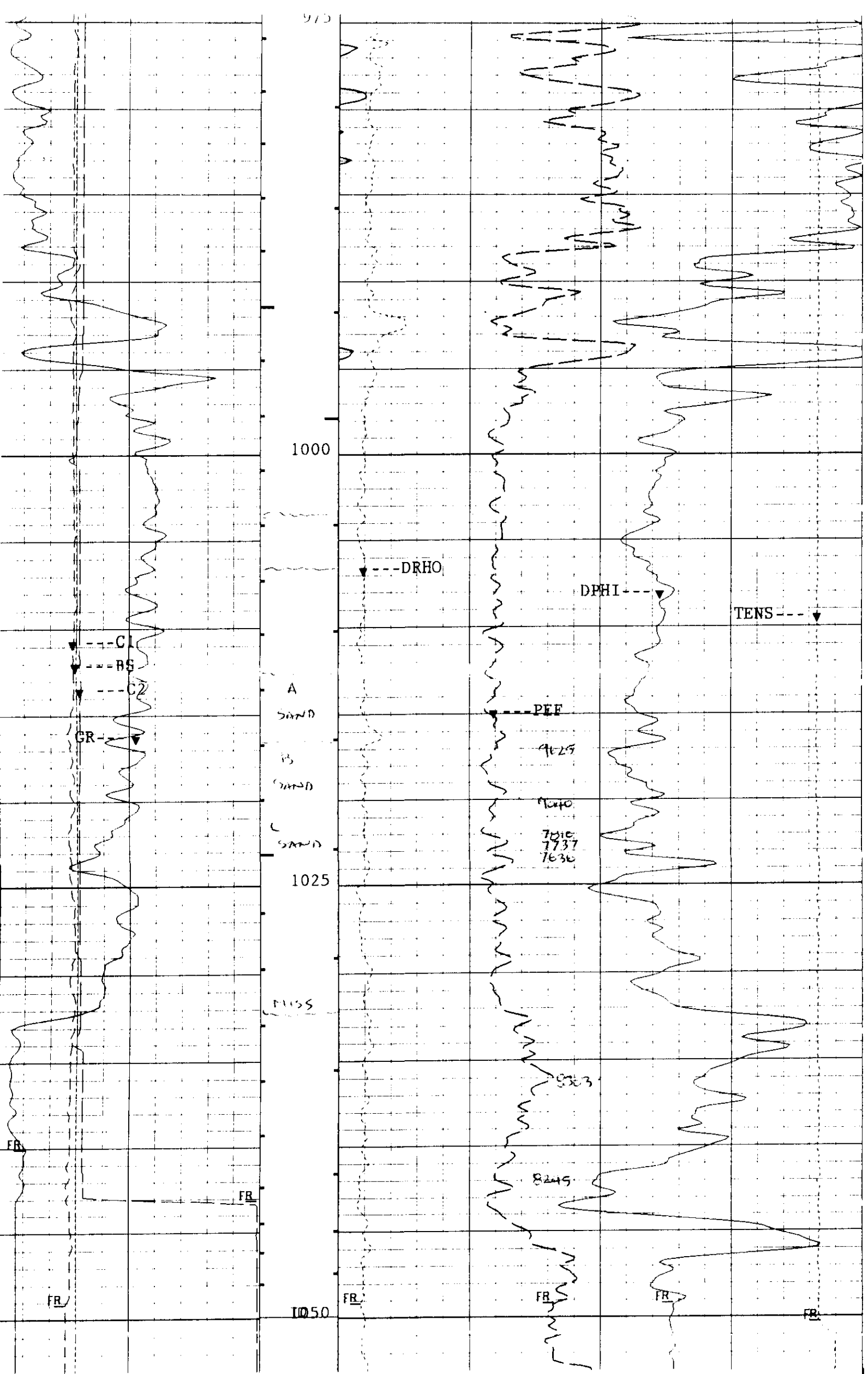
06-07-03-28	2 444.3	43.3	34.8	37.7	35.5	34.3	33.5	32.7	31.3					1.04	283.1	2 727.4
	7 293.5	283.2	223.1	233.5	229.6	232.8	230.8	239.2	219.2						1 891.4	9 184.9
10-07-03-28	3 344.8	27.9	23.8	27.1	25.8	25.0	27.2	27.3	26.2					0.87	210.3	3 555.1
	6 147.5	73.9	63.3	67.3	67.2	68.1	67.3	69.7	63.9						540.7	6 688.2



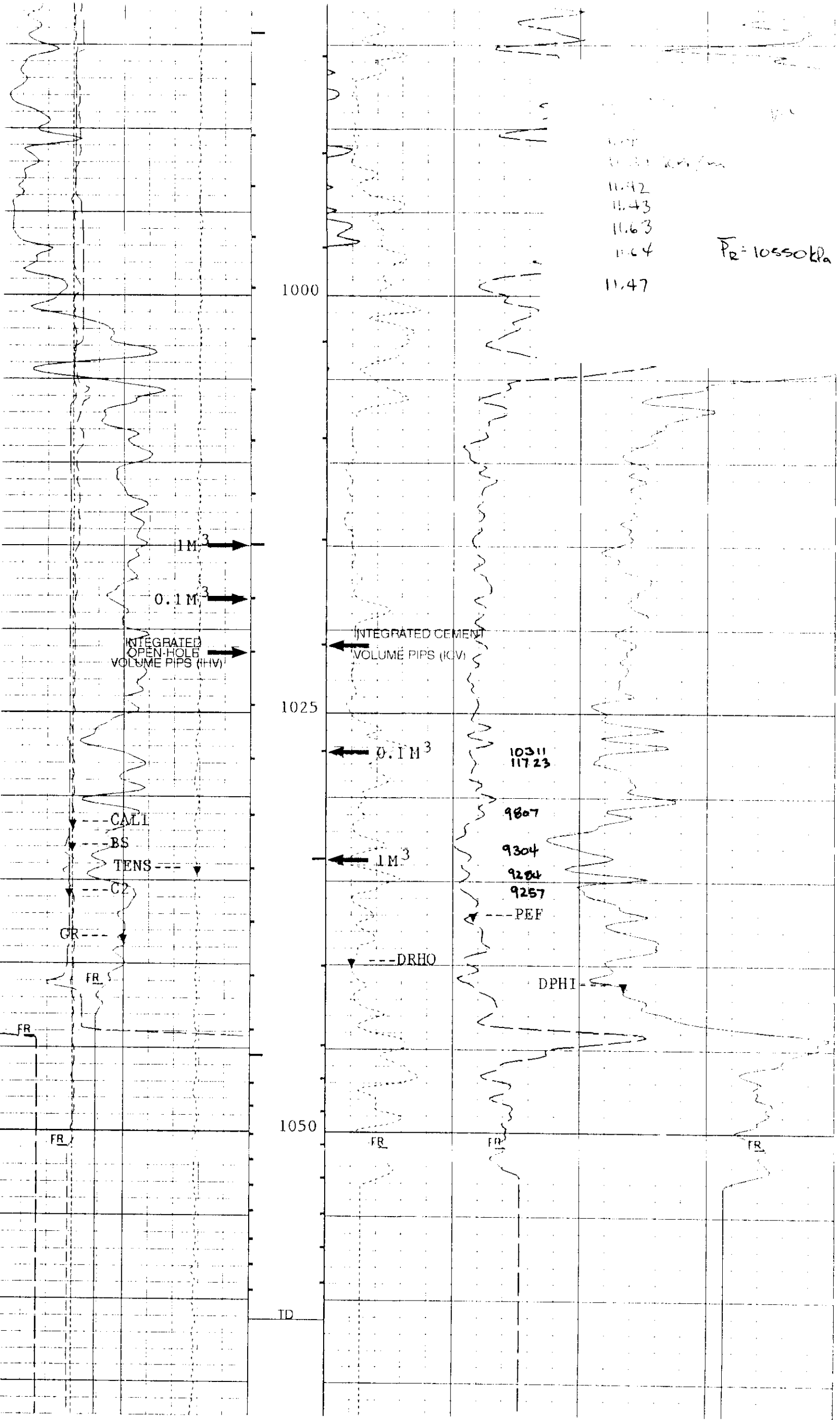


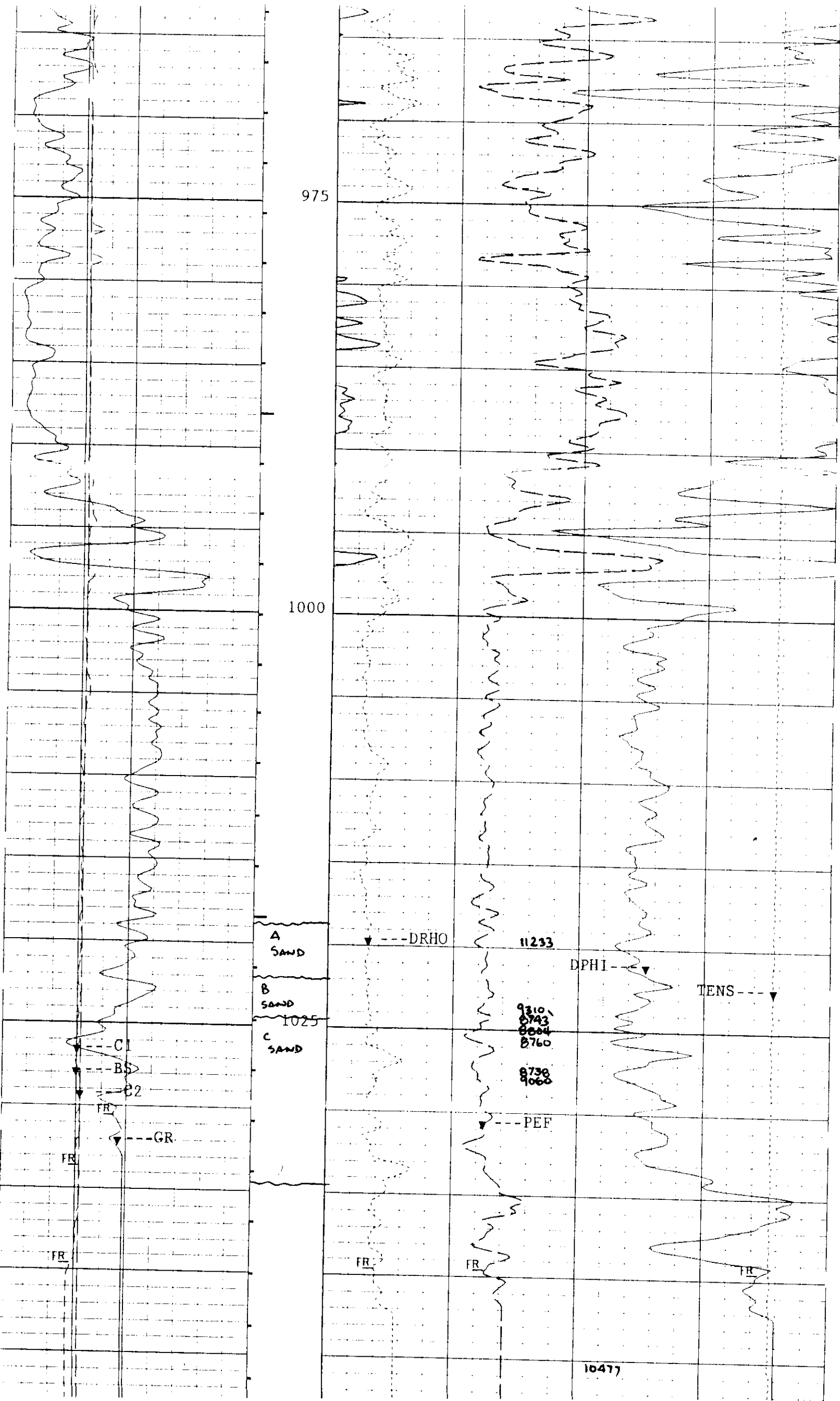






1/240





## OBJECTIVES of GRADING

- (1) prevent waste <sup>and maximize economic recovery</sup> → implementation of EOR scheme
- (2) promote orderly development - avoid the drilling of unnecessary wells,
- (3) protect cumulative rights - <sup>afford</sup> each owner <sup>(use/re)</sup> a <sup>reasonable</sup> opportunity to recover his just & equitable share of resources

1

Area of Application - 32 ha spacing

Figure 1 shows the area of application for 32 ha spacing including Home's and Tundra's lands.

Within the area of application there are 65 non-abandoned wells and 89 undrilled spacing units.


Area of application differs from the area approved under Board Order No. 54. 6 as Home's leases in 1/4 sections have expired (not including 3/4 <sup>acre</sup> section included in the permit area of application S/2 Sec 2 & S/4 Sec 29 (Jul 15/92) - remain unleased) (Oct 31/91)

## DEVELOPMENT PLANS

### TUNDRA

In its application Oct 1/91 Tundra indicated its wells in Sec 22 & 29 have been disappointing and presented economics that showed neither development on 16 or 32 ha spacing was economic.

	16 La	32 La
Initial Prod.	2.9 $\frac{1}{2}$ b	2.9 $\frac{1}{2}$ b
Recoverable Reserves	3221 m <sup>3</sup>	4916 $\frac{1}{2}$ b
NDV to BCF - 20%	- \$44000	- \$24000
EUR	7.9%	15%
Oil Price	\$132.15	\$132.15

- the results of HOC's preliminary waterflood study are discussed in the Branch's memo to the Board dated April 2, 1992
- Home's tentative plans are to implement a waterflood in the central portion of the LA-C Pool in the Fall 1993
- inverted 5 spot injection pattern of 16 hr spacing, converting existing producers to injectors
- the tentative unit area and injection conversions and infill drilling locations for 1993 are shown in Figure  . PHASE I
- Home plans to drill 19 wells in 1993 & convert 5 wells; infill drilling on 16 hr spacing would not commence until at least 2nd Q 93 after unitization completed
- attached Pioneer development schedule shows HOC plans, presently the company is behind schedule as its customers with all their undertakings in the Pioneer area

- Tundra indicated an oil price of \$157.72/m<sup>3</sup> was required for 32 ha development to be marginally economic
- it should be noted <sup>that using Tundra's numbers</sup> full development of the company's two sections 22 & 23 - 2 - 29 - 16 ha spacing would yield recoverable reserves of 103,122 m<sup>3</sup> versus 78,687 m<sup>3</sup> on 32 ha spacing

### Home Oil

- Home's lands fall into 3 categories
  - (1) Waterflood Phase I
  - (2) Waterflood Later Phases II-IV
  - (3) Non-Waterflood

### Waterflood - Phase I

Home submitted a <sup>preliminary</sup> 'waterflood' study for the LAm in May/92

- the study outlined a proposed waterflood area shown in the Figure

## MPPR

- daily production per well map illustrate productivity levels
- cumulat. production per well map (also showing % recovery based on BRANCH / HOC OOI/P/WOC)
- pressure impact map, attempt to calculate % recovery to date based on pressure data
- explain/discuss new wells IP (list new stimulation-treatment), outline MPPR provisions, review decline data, pool average, individual wells, make prediction for new wells outline impact of removal of MPPR increase (reaction of company)
- review GOR data pool-wide, individual wells
- QUESTIONS TO ADDRESS CONSERVATION/EQUITY ISSUES.
  - ① will the higher MPPR's significantly accelerate pressure depletion?
  - ② is a higher MPPR needed or does it apply to a limited number of wells and actually create an inequitable situation?
  - ③ how will reducing the MPPR affect HOC's economics, what will the company's reaction be (incentive to accelerate waterflood implementation)
  - ④



## NON-WATERFLOOD

- The Branch expects significant disagreement from HOC on what constitutes non-waterflood lands
- the Branch has developed arbitrary criteria for classification of lands as non-waterflood

- (1) at or near the productive limits of the pool (HOC may argue that refinement of its stimulation techniques will increase the probability of successfully completing well presently non-productive portions of the field)
- (2) low productivity and poor recovery (HOC in its response to the Board's 92-04-10 deficiency letter indicated it recognized wells near the productive limits were not capable of draining 32 ha)
- (3) undrilled/exploratory lands are high risk lands; recognizing that pool limits are economical rather than geologically defined

## Appropriate Spacing with Area of Application

### Non-Waterflooded Lands

- Some of the primary objectives of spacing are accomplished by continuing 32 ha on non-waterflooded lands

#### ① Maximize ultimate recovery & prevent waste

- both HUC and Turbia acknowledge at the productive limits of the pool, wells are not capable of draining 32 ha spacing
- both companies acknowledge developed on 16 ha spacing will increase recovery however both companies feel such development is only marginally economic (not economically attractive) → see Table
- past actions, lease extensions, lease expiries confirm company's opinion of lands

#### ② Promote orderly development

- past actions, lease extensions & expiries confirm company's opinion the lands have only marginal potential
- merit in increasing the flexibility in setting drilling targets by reducing spacing

- Not want to Tax company's financial resources and adversely affect investment in MB, detail more critical <sup>development</sup> plans by requiring company to drill offsets on protected land holdings
- not required to prevent the drilling of unnecessary wells
- CORRELATIVE RIGHTS
  - Not an issue
  - 32 to spacing protects company from mineral owners drilling 16 to offsets
  - perception that Board is trying to protect HQ's lease position
- if lease is not developed and OGP and productivity is lost the irreversibility of wellbore the company may apply for 32 to spacing and ultimately withdraw permit to implement a controlled

## Waterflood - Phase I

Apparentness of 32 ha. (Section 9)

- continuity of main sand (C' sand as Huc designated) evident from logs and recent RFT pressure data (see Fig.)

- RFTs from recently drilled wells at <sup>10-8 and</sup> 2-9, 6-9, 10-9 in the portion of the pool with the greatest cumulative production to date E/2 of Section 8 & Section 9

Jul/92	cumulative oil	55374.9	m <sup>3</sup>	7 mms
	cumulative water	109398	m <sup>3</sup>	

had reservoir pressures between 7660 - 9770 kPa, 1730 - 2840 kPa less than the discovery pressure

- apparent from the pressure data the wells in the better portions of the reservoir are capable of producing 32 ha. in the main sand
- RFT data in the poorer quality A & B sands showed little or no depletion at the 10-8, 2-9, 6-9 & 10-9 wells
- RFTs also showed evidence of no depletion

- discontinuation of 32 ha spacing at this time is directly dependent on HOC plans
- continuation of 32 ha spacing in the waterflood area will first be maintained with drawdown until the first waterflood is completed
- will also protect the recovery against offset wells and maintain uniform development for unitization negotiations
- Board prepared to maintain 32 ha spacing until HOC has unitized the Phase I waterflood area, upon the effective date of unitization as approved by the Board. The Phase I waterflood area spacing will revert to 16 ha.
- earliest anticipated date for unitization mid-1963.

- HOC still maintains that as the better portions of the reservoir fill drilling will not result in substantial incremental recovery (only accelerated production) and therefore is not economic.

### Depletion -

HOC in its WF study indicated that reservoir depletion is a concern.

- some wells are already exhibiting gas breakout as the severity of the wellbore as a result of reservoir pressure & the near wellbore region dropping beyond the bubble point pressure 4550 kPa
- HOC expects the average reservoir pressure to decline below the bubble point in 1-3 years
- individual well GORs are plotted and show a wide range  
 SED 192 Ave 62.9  $\text{L}/\text{L}^3$   
 Sol 602 54  $\text{L}/\text{L}^3$

- ORIGINAL MPPR  $m^3/d$  d  $240 m^3/month$   
 ADDING THE  $500 m^3$  OVER-PRODUCTION PERMITTED  
 DURING THE 6 MONTHS OF PRODUCTION (SUBSTANTION)  
 DAILY PRODUCTION  $10.6 m^3/d \approx 320 m^3/month$   
 VS.  $360 m^3/month$  presently approved under  
 Board Order No.

INITIAL PRODUCTIVITY OF MOC'S RECENT WELLS (1<sup>st</sup> WK of NOV)

14-8	6.5 $m^3/OPD$	WC - 16.8 %	pumped off
6-9	20.5 $m^3/OPD$	WC - 32 %	67 ft to fluid
10-9	8.3 $m^3/OPD$	WC - 9.4 %	61 ft to fluid
10-8	11.7 $m^3/OPD$	WC - 6 %	34 ft to fluid
2-9	7.6 $m^3/OPD$	WC - 16 %	78 ft to fluid

10-8 would have to have an initial <sup>exp.</sup> decline rate  
 of 41.6 %/yr to not over-produce during  
 the 1<sup>st</sup> 6 months of production, after 6 months  
 the production rate would be 9.5  $m^3/d$   
 vs an MPPR of 8  $m^3/d$

## SPACING

- DIVIDE AREA OF APPLICATION 3 SECTS

- WATERFLOOD PHASE I

- WATERFLOOD WATER PHASES II, III

- NON WATERFLOOD

NON WATERFLOOD (16 ha)

- AT OR NEAR PRODUCTIVE LIMITS OF POOL

- LOW PRODUCTIVITY, ~~POOR~~ RECOVERY

- UNDRILLED / EXPLORATORY / HIGH RISK LANDS

- RECOGNIZED; WELLS TYPICALLY NOT CAPABLE OF DRILLING 32 ha

LANDS RECOGNIZED THAT <sup>HUC'S</sup> DRILLING ECONOMICS IN SUCH AREAS (ON 16 ha) ARE MARGINAL IN TUNDRA

- HOWEVER 32 ha SPACING UNWARRANTED

- recognition that pool limits are economical rather than geologically defined

NOT NECESSARY TO PREVENT

THE DRILLING OF UNNECESSARY

(2) NOT MAXIMIZE RECOVERY (INSTEAD

DRILLING WILL RESULT IN INCREMENTAL RECOVERY)

3) ACTS TO STERILIZE LANDS

FROM DEVELOPMENT BY PROTECTING HUC'S LANDBASE

4) INDUCES EFFECTS CORRELATIVE RIGHTS

(i.e. OFFSETS, RIGHT TO RECOVER RESOURCES, CLOS



## WATERFLOOD - LATER PHASES (32 ha)

- recognition of orderly development
- systematic exploitation
- reasonable depletion strategy to implement and evaluation performance of Phase I
- recognition of sensitivity of waterflood economics to degree of reservoir depletion to  $\text{Break-up}$   $\approx$   $\frac{\text{U. quarter line}}{\text{to Break-up}}$ 
  - $\uparrow$  reservoir pressure = increased productivity
- avoid accelerating depletion by early drilling
- evidence to support 32 ha drainage
- which areas contemplated by HOC for Phases II & III
- expectations of Board

co-produce HC/LA while injecting exclusively into LA

## WATERFLOOD - PHASE 1

- Spacing clearly dependent on HOC plans

① 32 to spacing limit until WF implemented

② if company plans to LFI drill in the winter/spring (Jan - mar/93) construction of 32 to spacing appears redundant

③ Board expectations regarding LFI drilling prior to WF implementation & impact on alt. rec., timing of drilling vs imp.

- wells exhibiting gas breakout (gas coming out of sol<sup>n</sup>) in the vicinity of the wellbore  
drawdown of reservoir pressure <sup>near res. press.</sup> near wellbore < bubble pt.  
result in increasing GOR;
- expectation is average reservoir press. will decline to near bubble pt. in 1-3 years

OOIP  $7 \times 10^6 \text{ m}^3$  RF = 7.2% OOIP ROIP = 504 600 L<sup>3</sup>  
(LAN RF = 3.2% OOIP)

- new wells unstabilized production period 1-6 wks

- existing wells 44 (Mue/az) ~ RoIP (primary) 286041  $\text{m}^3$   
 remaining 218,571 to be recovered from undrilled  
 32 low wells

RFT  $\rightarrow$  shows reservoir continuity

Tracy - Tanner estimate RF = 2.1%, RoIP to bubble pt  
 (on 94318  $\text{m}^3$ )

$h = 4.3 \text{ m}$  cost-off  $\phi = 12\%$   $k = 1 \text{ md}$

$\phi = 15\%$

$k = 3.5 \text{ md}$

$C_r = .29 - 1.74 \times 10^{-6} \text{ kPa}^{-1}$  (and  $1.34 \times 10^{-6} \text{ kPa}^{-1}$ )

$S_{wc} = 41 = S_{wi}$

$S_{no} = 31\%$

$T_R = 40^\circ\text{C}$

$\bar{P}_R = 10500 \text{ kPa}$

$P_{bpt} = 4550 \text{ kPa}$

$B_{oi} = 1.169$

$\mu_i = 1.35 \text{ mPa}\cdot\text{s}$

$B_{obpt} = 1.178$

$\mu_{bpt} = 1.24 \text{ mPa}\cdot\text{s}$

$C_o = 10.83 \times 10^{-7} \text{ kPa}^{-1}$

$C_w = 4.86 \times 10^{-7} \text{ kPa}^{-1}$

$\mu_w = 0.865$



## OUTSTANDING ISSUES

### SPACING AND NPPD ORDERS

Boase intends to complete the revision of the spacing and NPPD application in October. The Board will review the findings and proposed interim policy regarding a 10' distance.

### WATERFLOOD FEASIBILITY

- List various expenses of the study regarding a study for implementation of waterflood options
- Discuss results
- Review regulations
- continued confidentiality of waterflood study

HOC Response <sup>(Jul 11/92)</sup> to Board Deficiency Letter (April 92)

### SPACING

- missing HCPV & KH maps

→ WF STUDY PRIMARY RF = 7.2 / 1000 down from original estimates of RF =         

→ HOC suggest 32 La effectively draining most of Pieson Field & 16 La spacing will accelerate production (with min. A recovery) but economic is uncertain

→ WF will require 16 La spacing

→ 16 ha drainage is peripheral area of field  
16 La SU recovery 5000 m<sup>3</sup> IP = 2.5 m<sup>3</sup>/d

HOC OPERATIVE ECONOMICS AIR NDV @ Dec 12% = 2,900  
\$21/Lb (132.15/m<sup>3</sup>) BGR = 12.4%  
Payback 4.2 years

HOC PIESON oil PRICES 1992

Jan	112.23	Apr	123.08	Jul	148.00
Feb	121.25	May	136.33	Aug	140.71
Mar	111.81	Jun	153.11	Sep	149.20
				Oct	154.41 (mB US\$)

- HOC recognizes some wells w edge of seal not draining 32 La. indicated after completion on HCPV map (Jul 92) <sup>not need</sup> ~~have~~ advise Board of which stands company would like to include

## NC DEPLETION STRATEGY

- Stand alone NC drilling economics are not favourable  
AIT NPV @ Def = 15% -24,500  
IP = 1.5-3 ROE 11.7%  
Pay-out 7.3 yrs
- striping of deep rights on Crown lands
- identify and produce NC reserves.
- operationally possible under LFN WF scheme

## Recommendations

- request HOC if company wishes to withdraw its applications
- o rippe to prevent accelerated depletion, a concern expressed in the WF study
- o 32 ha Spacing (a) edge of pool, 32 ha not being drilled  
(b) in WF also, plans to install  
drill on 16 ha in early 1993
- dilemma facing the Board



# SOUTH PIERSON FIELD

## RESERVOIR CHARACTERISTICS

Average Well Depth:	1050 meters
Producing Formation:	Lower Amaranth (Primary - Siltstone) Mission Canyon (Secondary - Carbonate)
Reservoir Drive Mechanism:	Expansion Drive above Bubble Point Undersaturated
Initial Reservoir Pressure:	10,550 kPa
Current Reservoir Pressure:	9,500 kPa (estimated)
Bubble Point Pressure:	4,650 kPa
Current Well Spacing:	32 Hectare
Average Permeability:	2 - 3 md
Average Net Pay:	3.8 - 4.3 meters
Average Porosity:	15%
Rock Compressibility:	$0.87 \times 10^{-6}$ 1/kPa
Oil Compressibility:	$10.83 \times 10^{-7}$ 1/kPa
Water Compressibility:	$4.86 \times 10^{-7}$ 1/kPa
Connate Water Saturation:	41%
Average Initial Water Saturation:	45%
Oil Gravity:	36° API
Reservoir Temperature:	40° C
Oil Formation Volume Factor:	1.178 Initial 1.169 Bubble Point

**FACSIMILE TRANSMISSION  
COVER SHEET**

**Home Oil Company Limited**



DATE:	Thu, Nov 12, 1992
TIME:	4:30 PM
CHARGE TO:	DEPT. 240

**TO:**

NAME:	J.N. FOX	
COMPANY:	MANITOBA ENERGY AND MINES	FAX No: (204) 945-0586
LOCATION:	WINNIPEG, MANITOBA	CONTACT No: (204) 945-6574

**FROM:**

NAME:	DON CAIRNS	FAX No: (403) 232-7102
LOCATION:	CALGARY	CONTACT No: (403) 232-7337

TOTAL NUMBER OF PAGES  
(INCLUDING THIS PAGE): 2

**COMMENTS:**

**Re: SOUTH PIERSON 1993 INFILL DRILLING PROGRAM (19 WELLS)  
HOWEVER ONLY 3 OF 19 WELLS CAN BE DRILLED PRIOR TO  
UNITIZATION. THE FOLLOWING WILL FINISH OUR 80 ACRE  
SPACING APPLICATION:  
10-04-002-29W1M, 12-04-002-29W1M, 02-08-002-29W1M**

**AFTER UNITIZATION 16 OF 19 WELLS CAN BE DRILLED, THE  
FOLLOWING ARE ON 40 ACRE SPACING:**

**13-04-002-29W1M, 01-08-002-29W1M, 07-08-002-29W1M  
09-08-002-29W1M, 11-08-002-29W1M, 15-08-002-29W1M  
03-09-002-29W1M, 05-09-002-29W1M, 07-09-002-29W1M  
11-09-002-29W1M, 13-09-002-29W1M, 15-09-002-29W1M  
01-16-002-29W1M, 03-16-002-29W1M, 01-17-002-29W1M  
03-17-002-29W1M**

**OUR DRILLING BUDGET MONEY IS SCHEDULED FOR THE  
SECOND QTR. OF 1993, AS PER OUR DISCUSSION. IF YOU  
HAVE ANY QUESTIONS PLEASE GIVE ME A CALL.**

32 to SPeiling

### Area of Application -

\* of remaining undrilled Sci's

Crew expires since Apr 1992

- update daily & cumul oil production - maps  
- can do a current & ultimate recovery map

- need HOC's 1993 drilling plans

GOR map (64.87.44 Q0/91)

Bubble pt - 4600 kPa  
2-3 yrs until bubble pt.  
reach -

- pressure plot

### - CORE AREA ASSESSMENT

- WF PROJECT AREA

CURRENT

- PRODUCTIVITY & CUM PRODUCTION cut-offs

- EST. ULTIMATE PRIMARY Recovery

- missing Gh map

- under waterflood the pool developed - 16 La spacing  
→ current existing production - 3 spot  
- marginal incremental recovery on 16 La spacing  
NE-SW k factor observed - creates able-q drainage  
cells

- delayed implementation - on increased depletion  
results in a delayed waterflood response which  
negatively impacts project economics. ult rec is not  
adversely affected

- address influx of NC oil / water to pressure support

FIGURE NO. 1

Twp 02

SASKATCHEWAN

MANI

Pierson

AREA OF APPLICATION

TUNDRA OIL & GAS LTD.

256



LANDS CONSIDERED FOR EXCLUSION  
FROM 32 ha SPACING APPROVAL

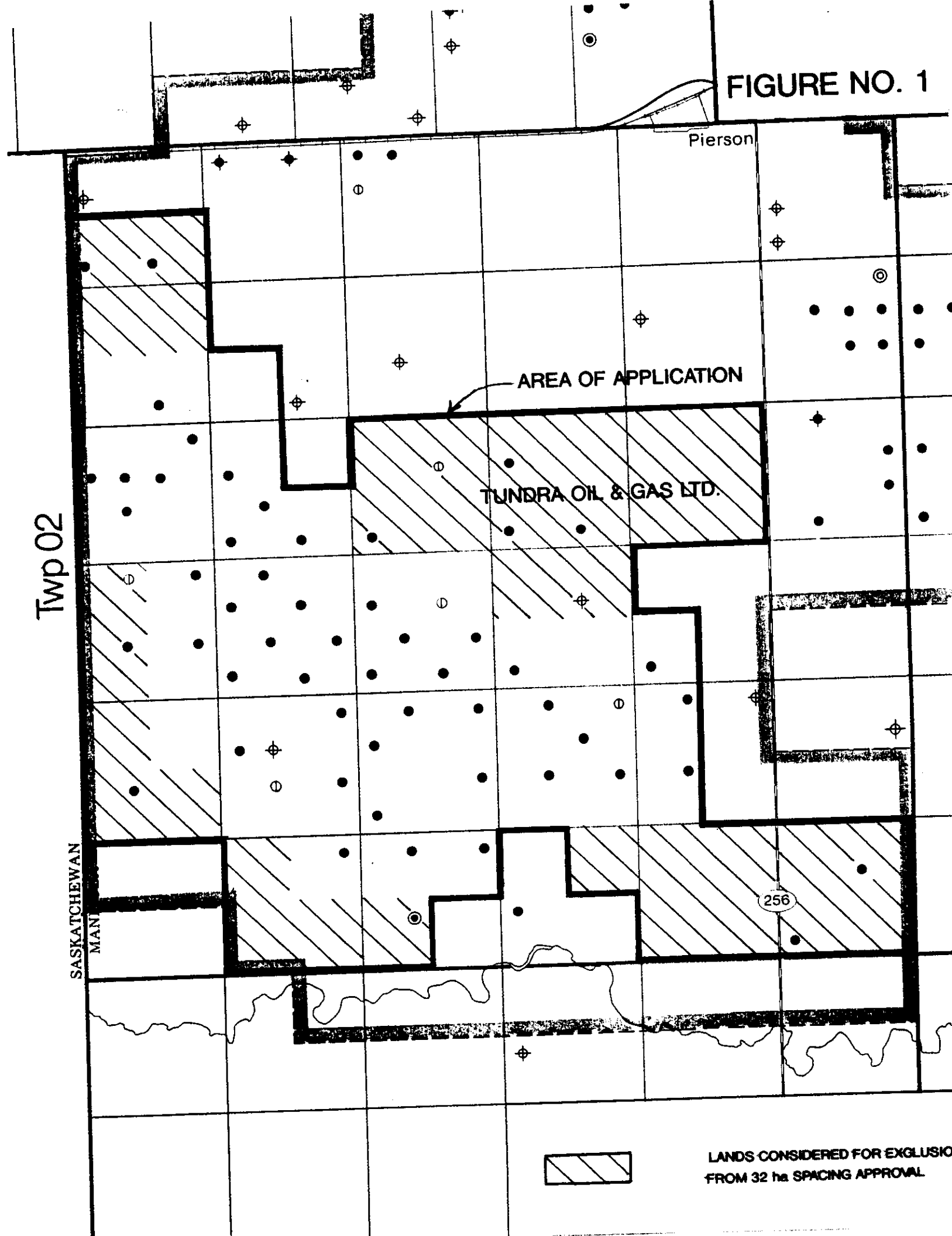


Figure 1.0

# SOUTH PIERSON AREA

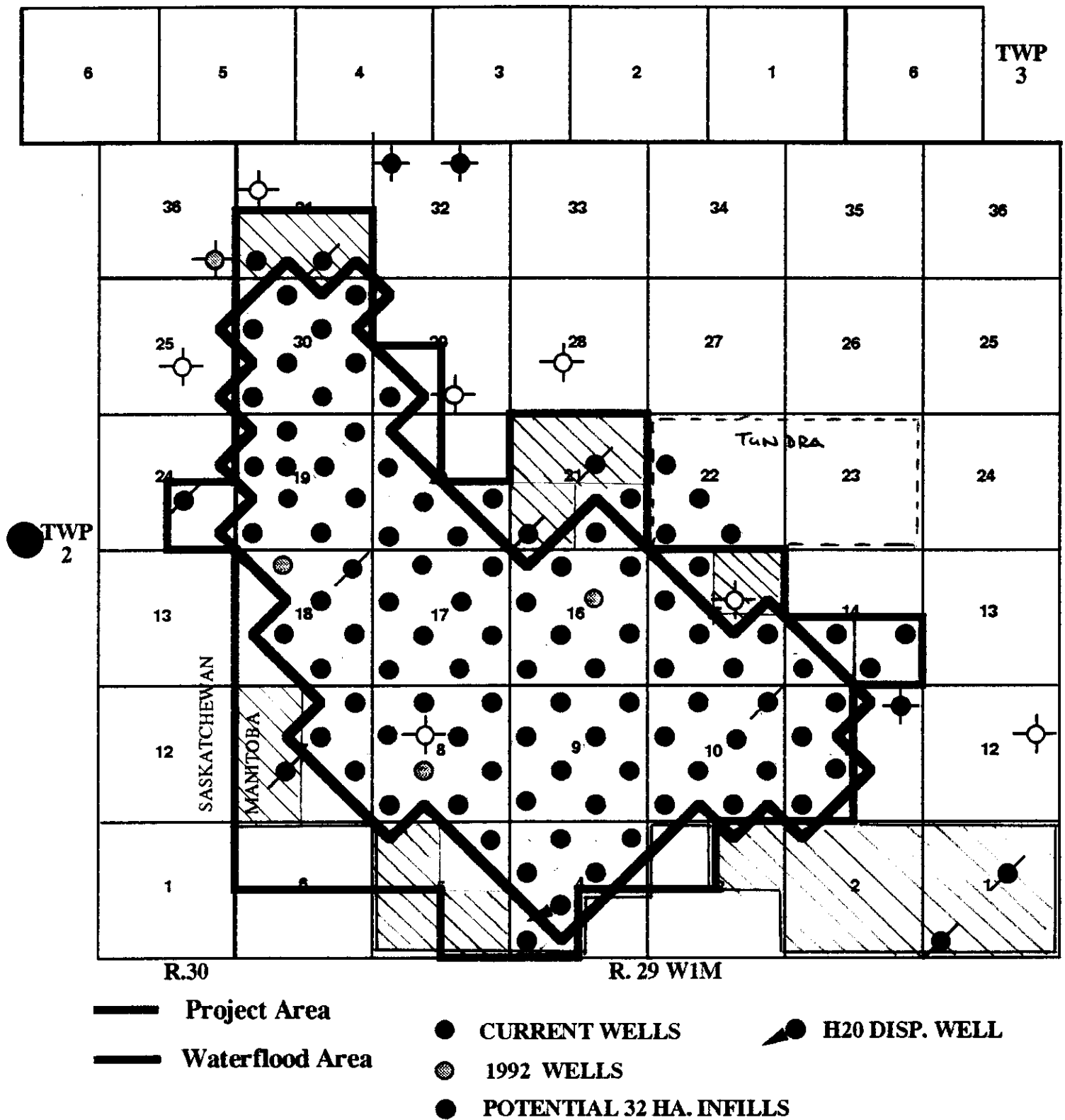


FIGURE NO. 3

Twp 02

SASKATCHEWAN  
MANITOBA

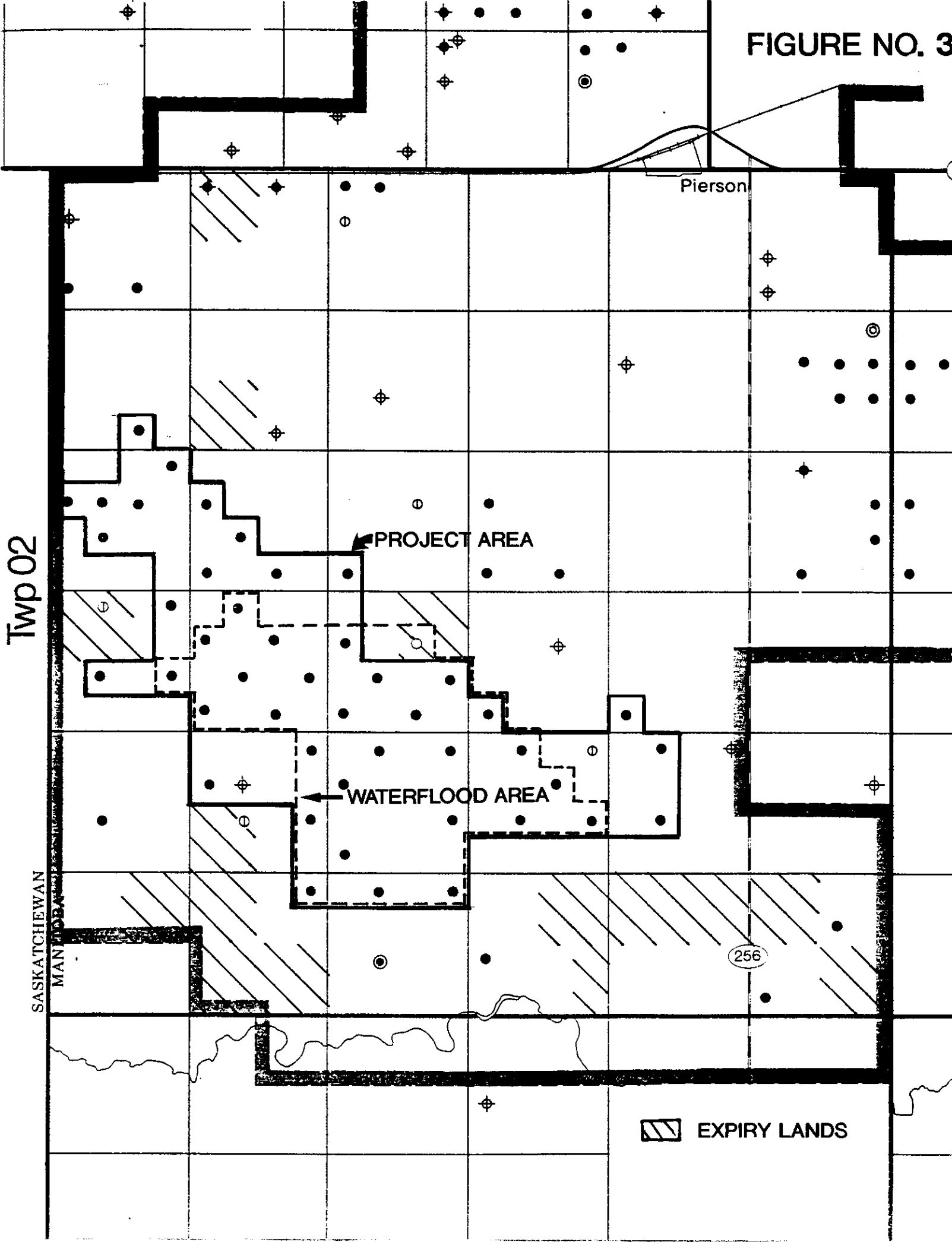
Pierson

PROJECT AREA

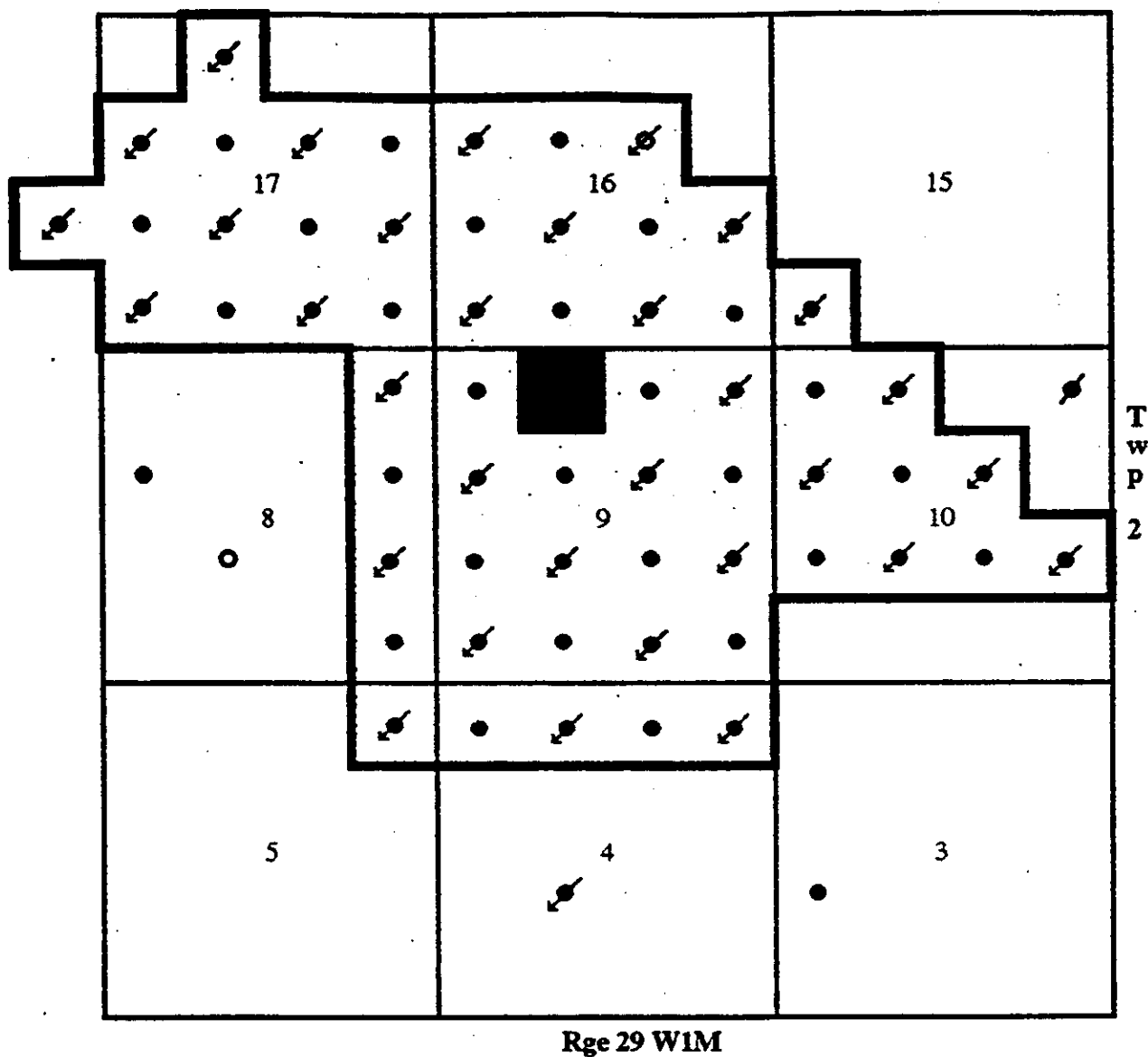
WATERFLOOD AREA

256

 EXPIRY LANDS



**SOUTH PIERSON WATERFLOOD AREA**



 **Proposed Waterflood Area**

 **Central Facilities**

 **Current Producing Wells converted to Injectors**

 **Infill Drilling Locations**

 **1992 Drilling Locations**

Twp 02

SASKATCHEWAN

MAN

3

Pierson

AREA OF APPLICATION

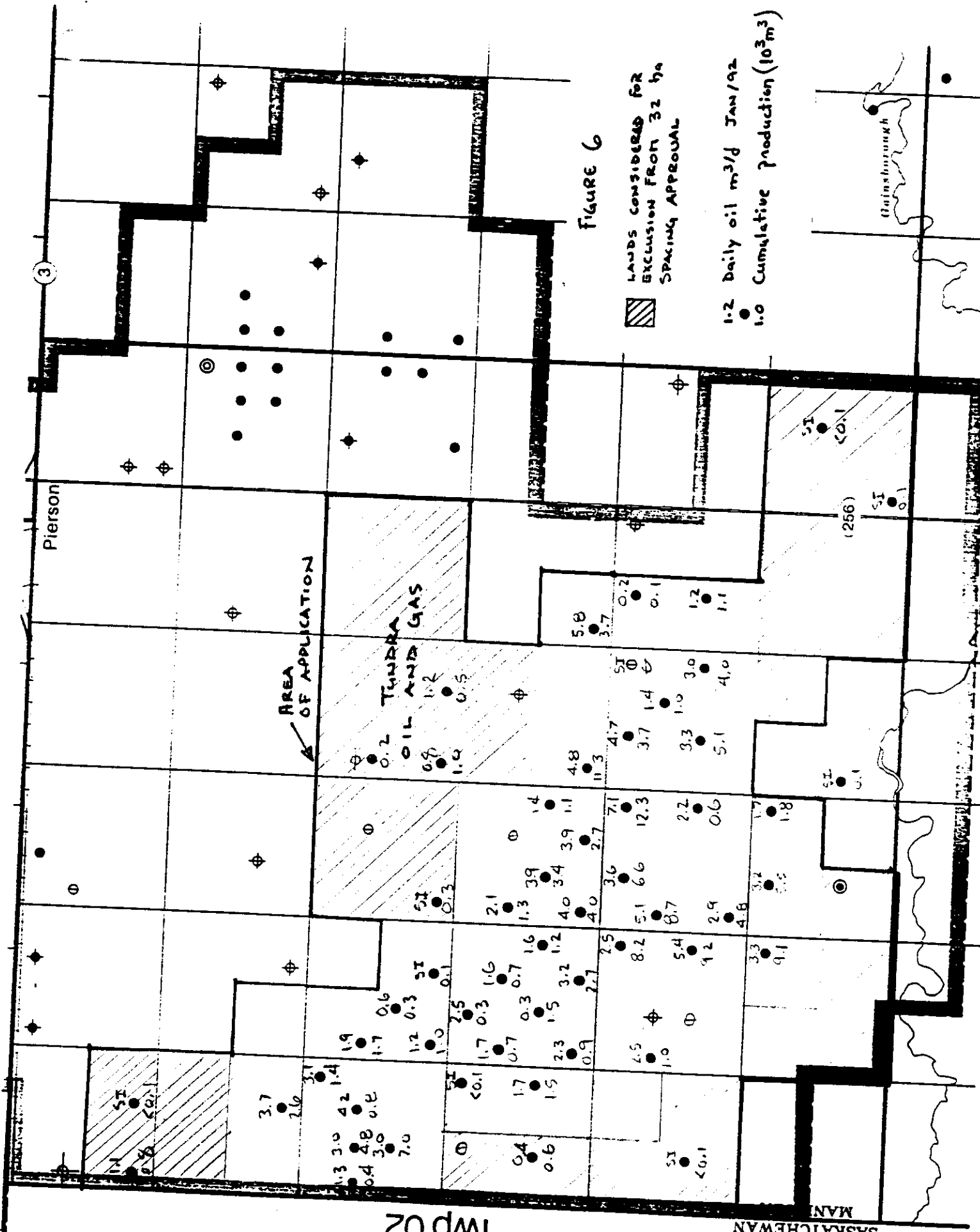
TUNDRA OIL AND GAS

FIGURE 6

LANDS CONSIDERED FOR EXCLUSION FROM 32 ha SPARKING APPROVAL

1.2 Daily oil m<sup>3</sup>/d JAN/92  
1.0 Cumulative production (10<sup>3</sup>m<sup>3</sup>)

Gainsborough





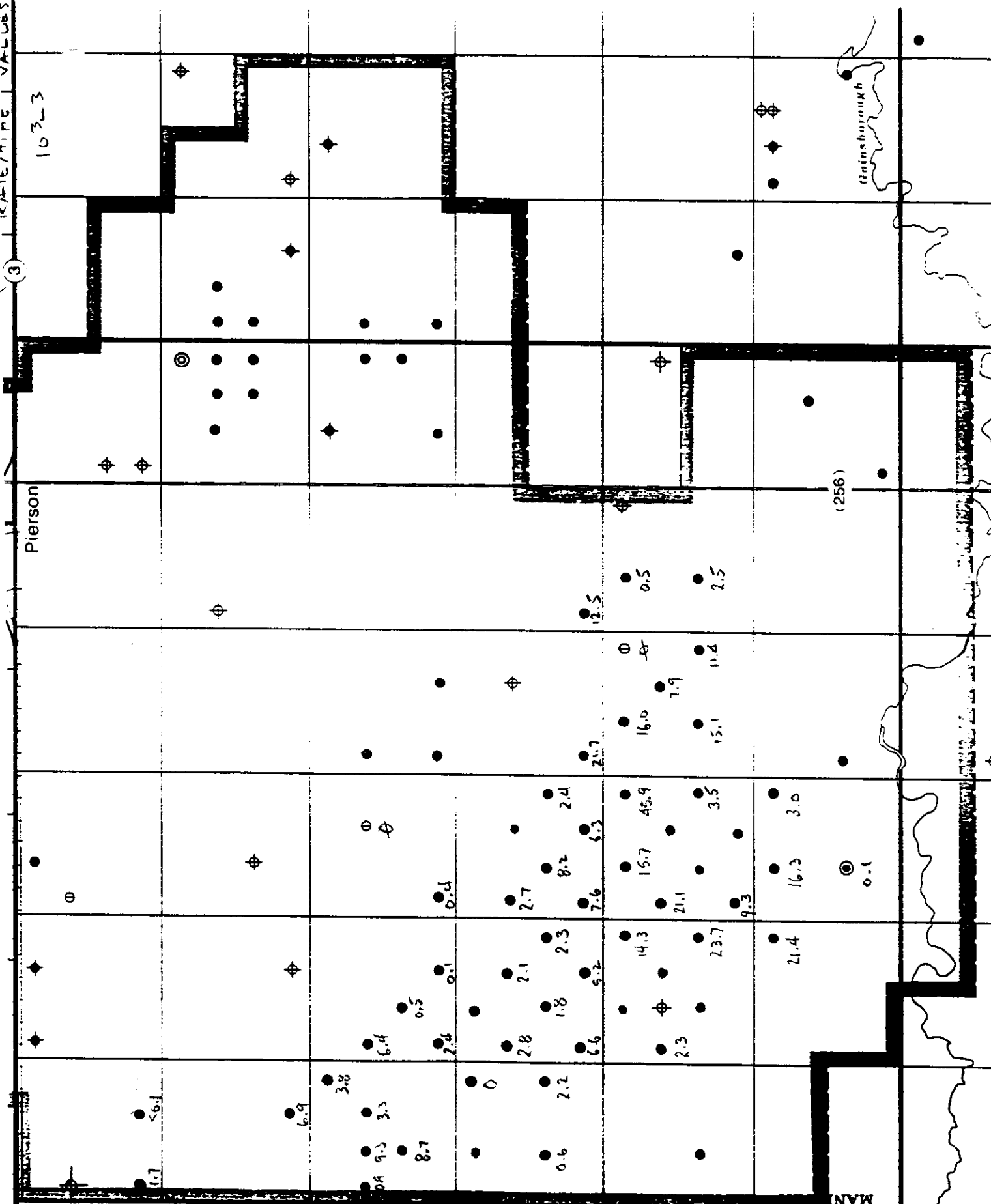


Figure 3.0

# SOUTH PIERSON FIELD - RATE VS TIME PLOT

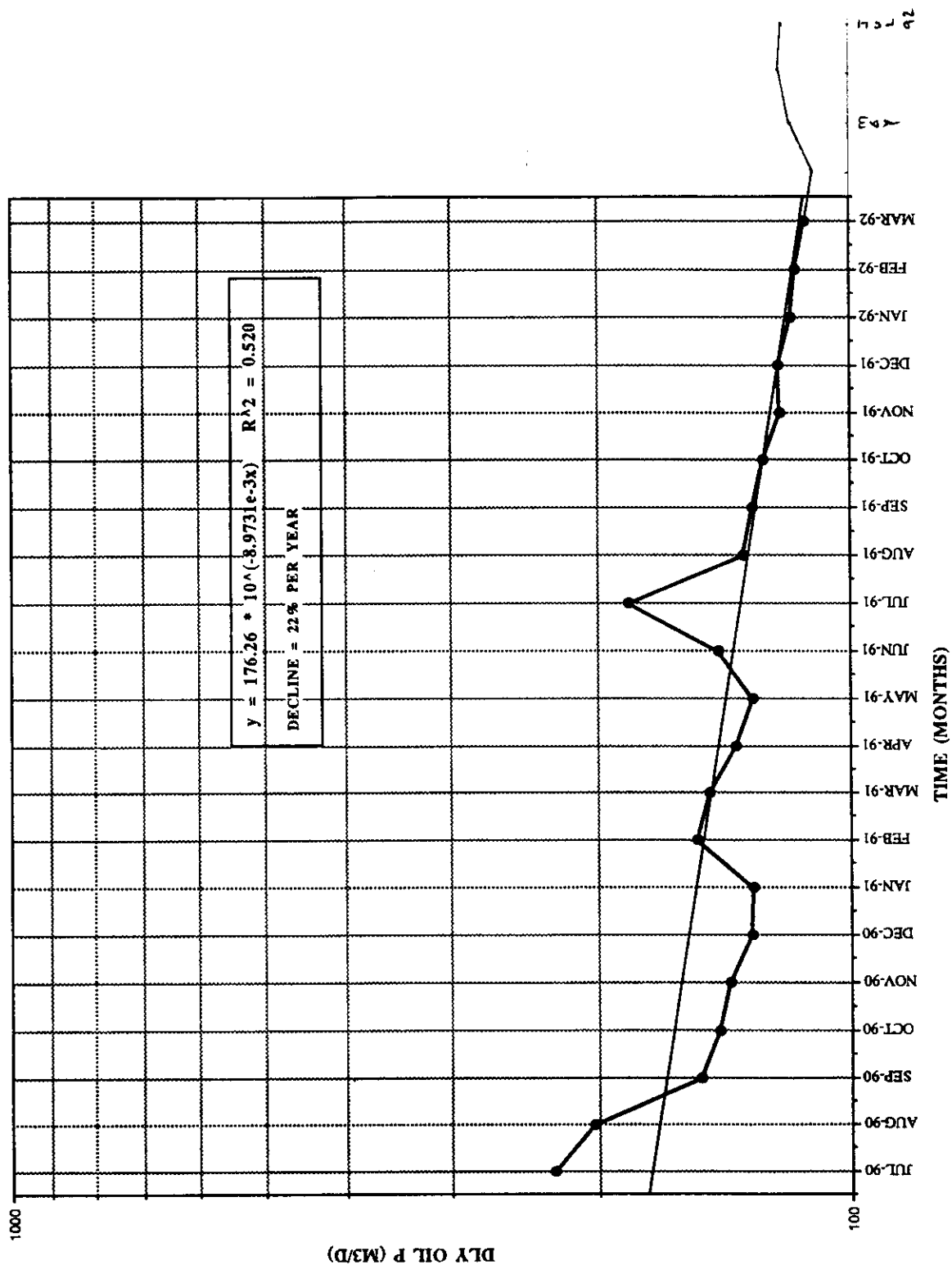
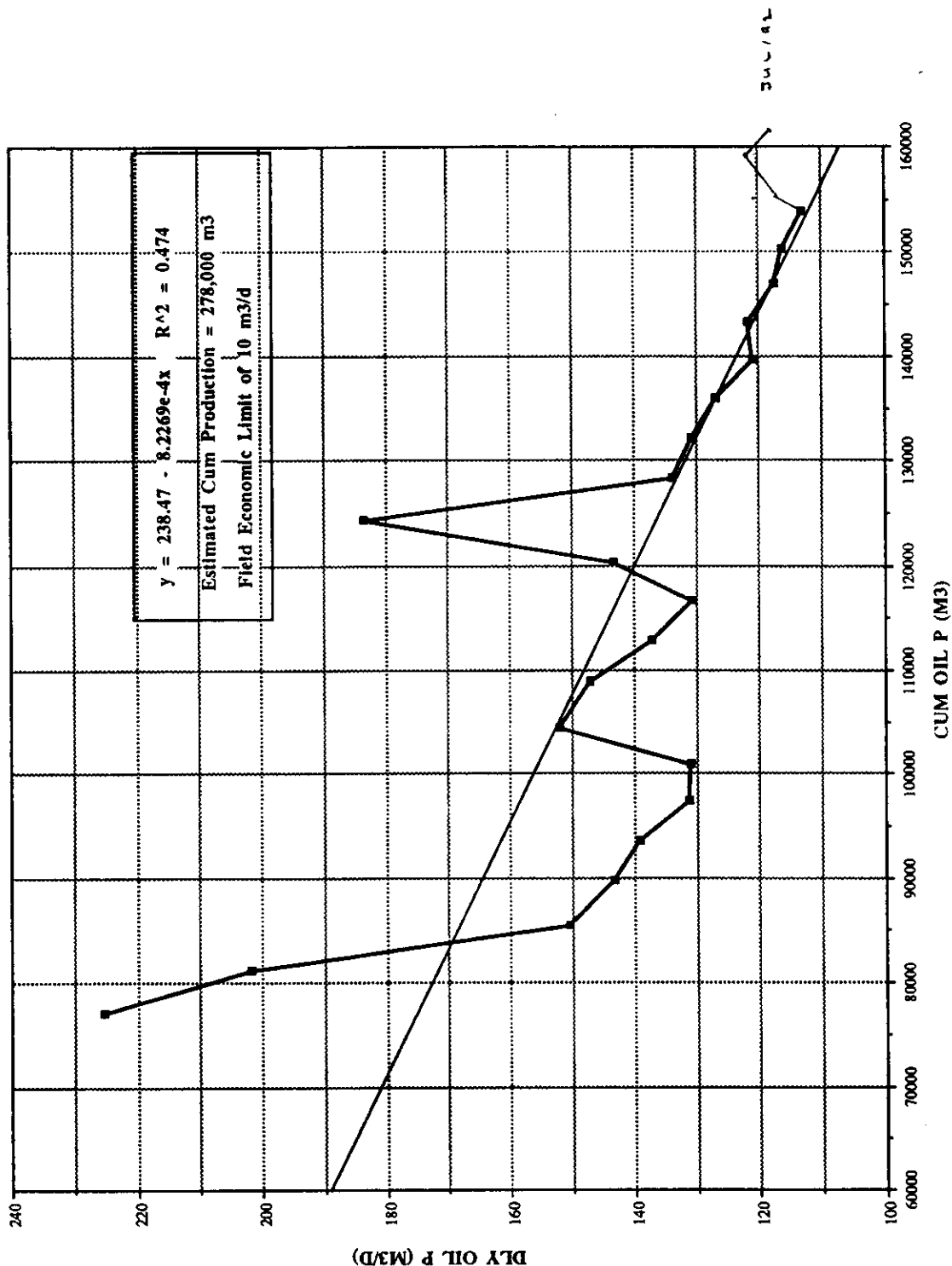
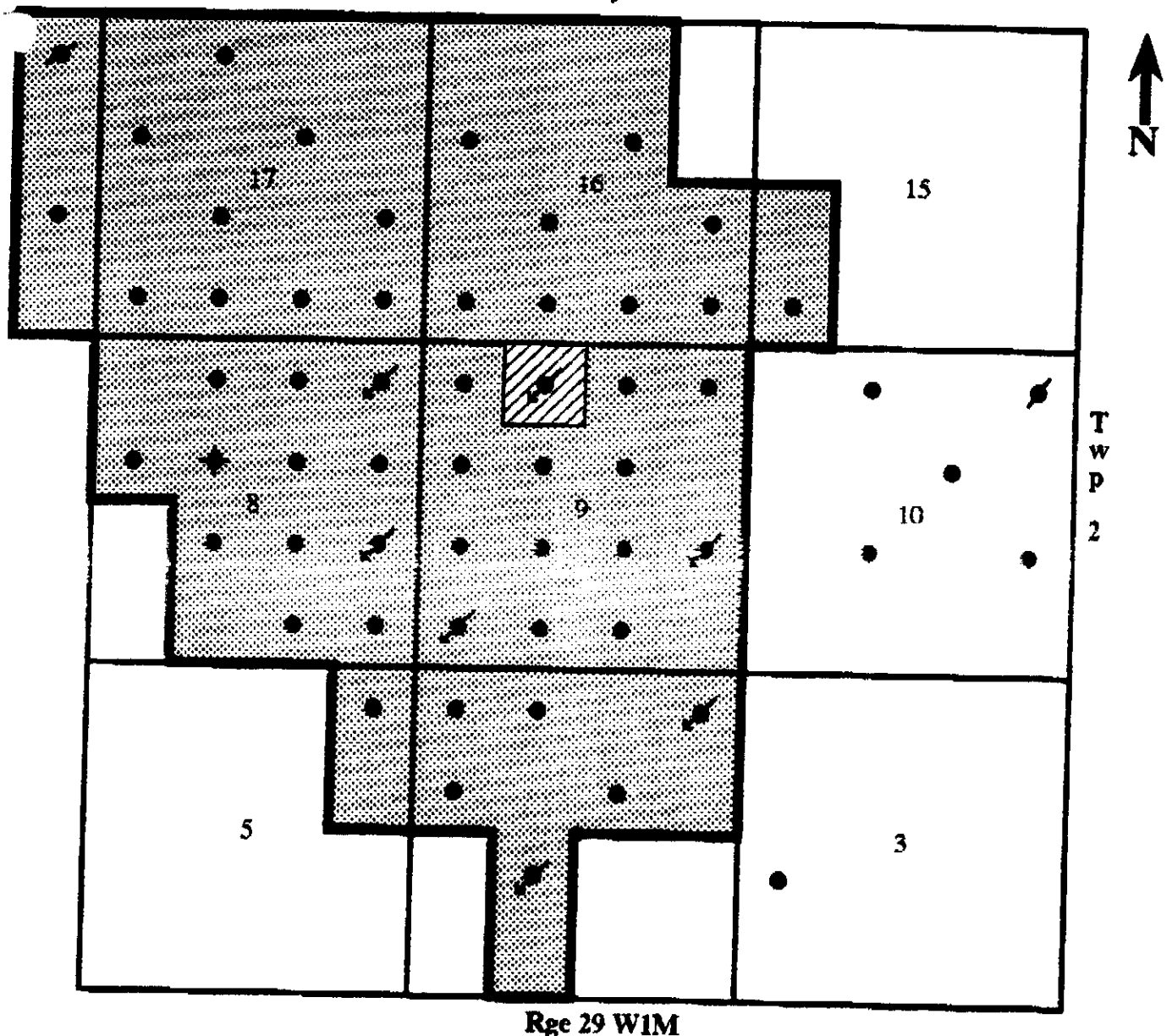


Figure 2.0

# SOUTH PIERSON FIELD - RATE VS CUM PLOT



# SOUTH PIERSON, Manitoba



**Proposed Waterflood Area**



**Central Facilities**

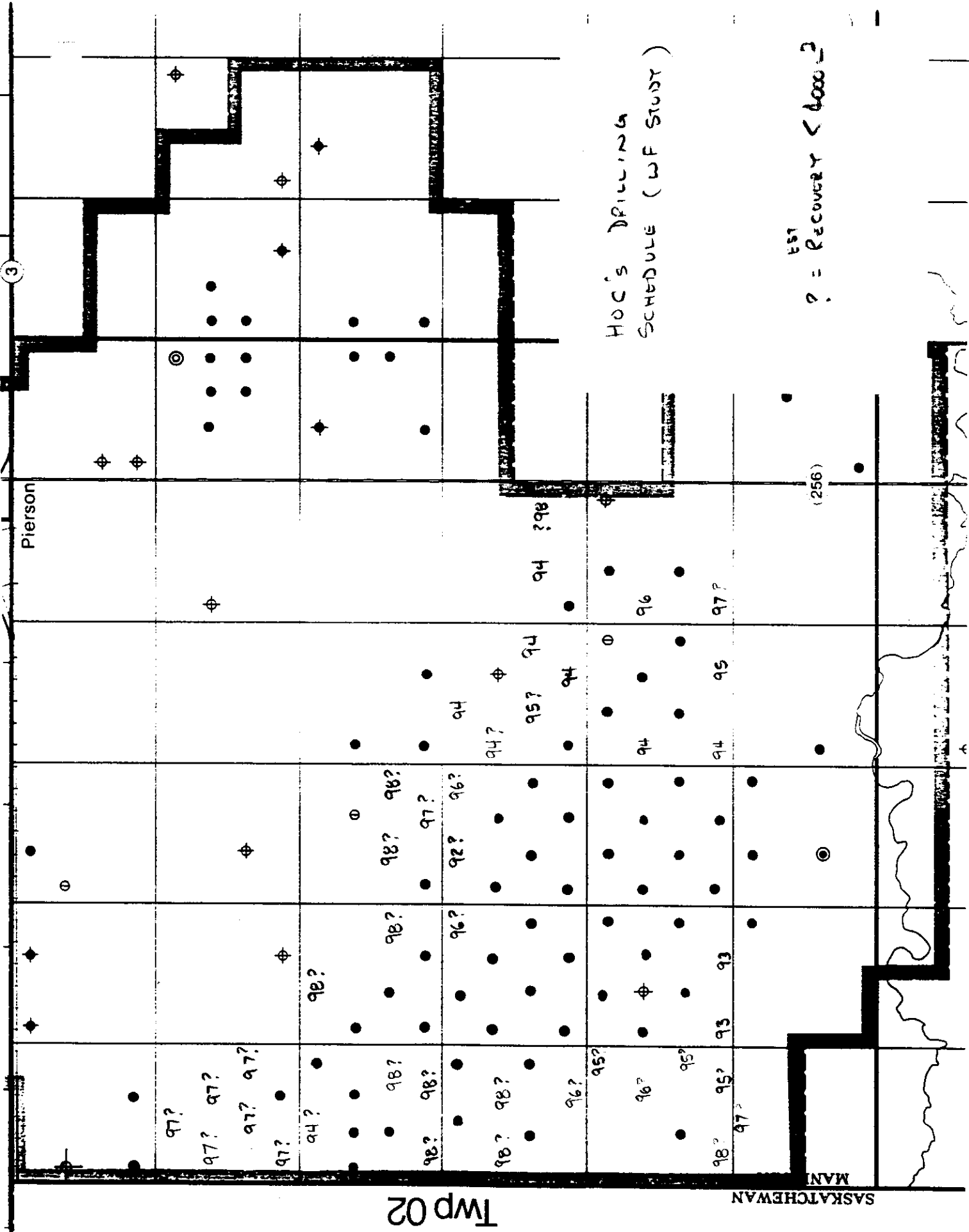
- **Current Producing Wells**
- **1992 Infill Wells**
- **1993 Infill Wells**

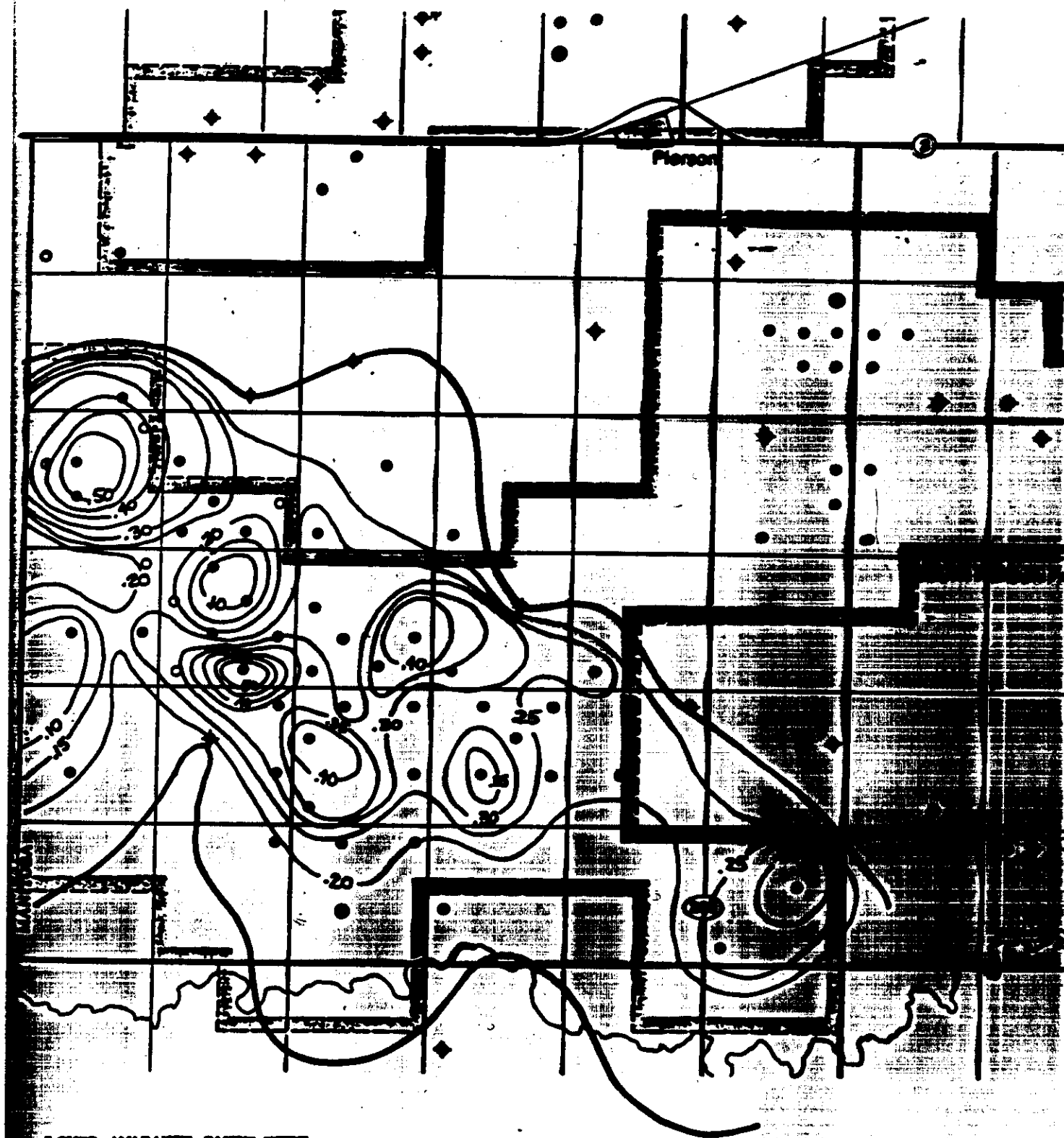
SASKATCHEWAN  
MANIT

$$t_{57} = \text{Recovery} < 6000 \text{ s}$$

157

157





LOWER AMARANTE SANDY UNIT  
ORIGINAL OIL-IN-PLACE PER UNIT AREA MAP  
contour int.: 0.05 m<sup>3</sup>/m<sup>2</sup>

FIGURE 1  
SOUTH PIERSON AREA  
 (REVISED)

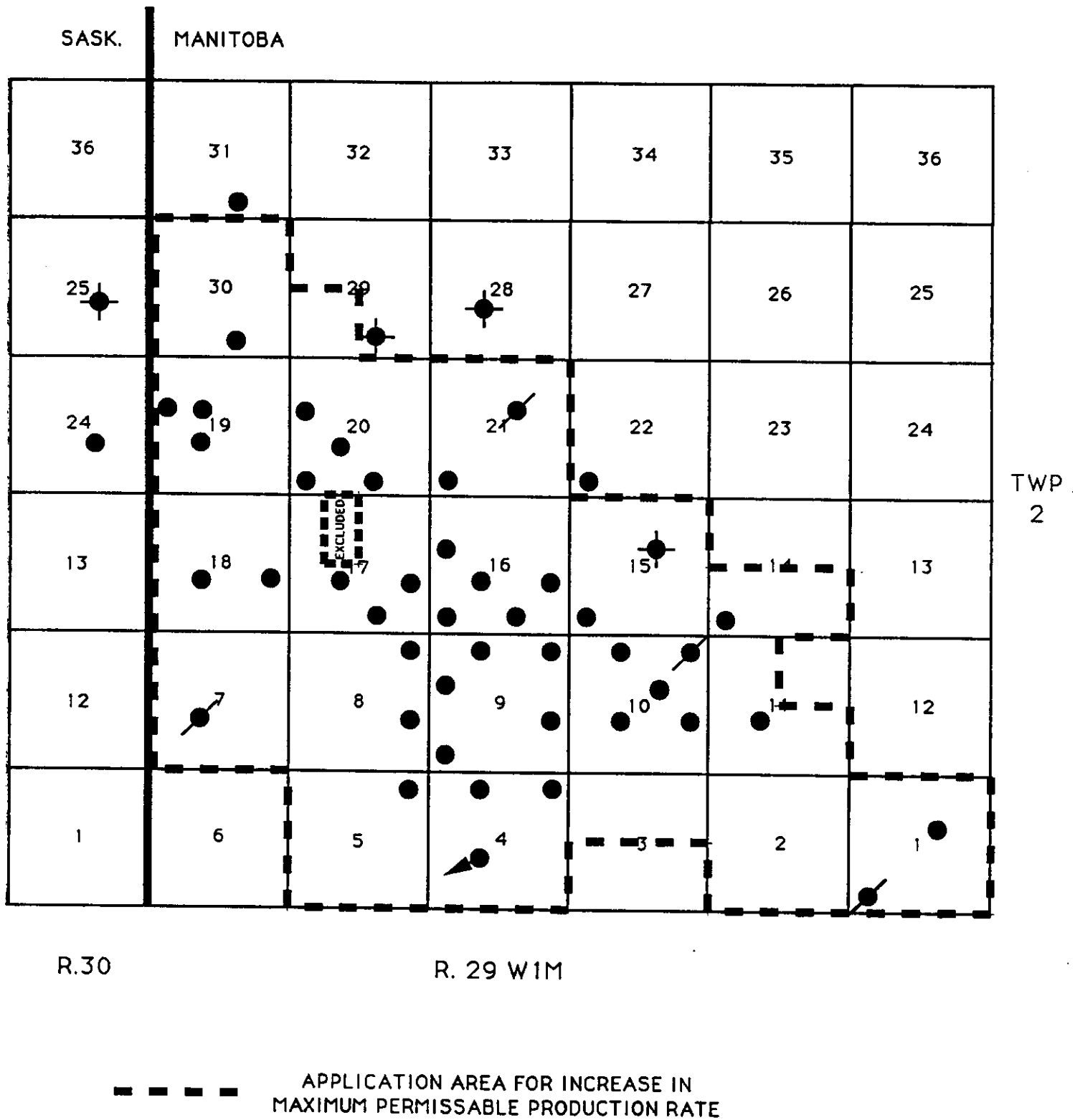
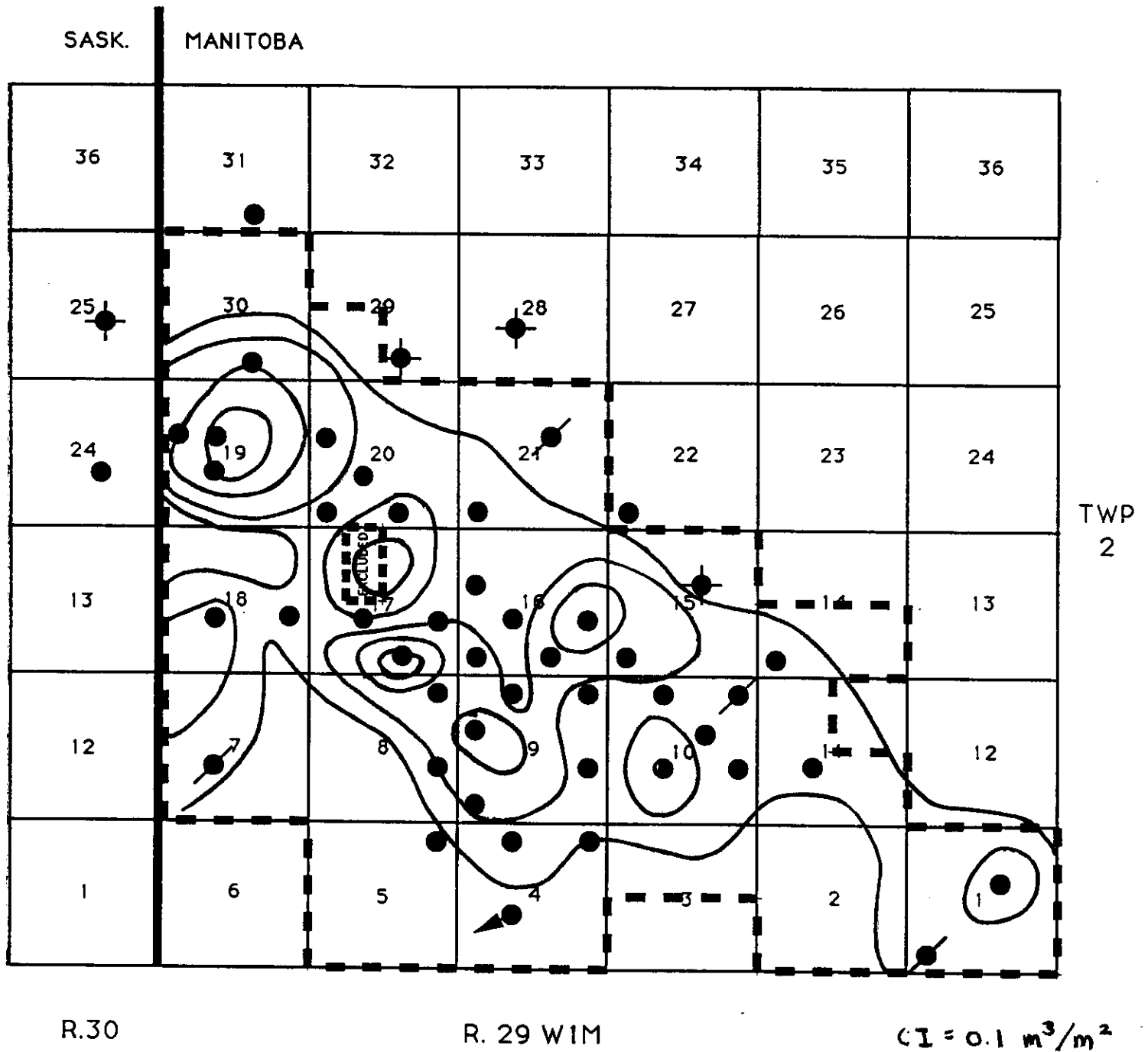


FIGURE 3

ORIGINAL OIL-IN-PLACE/UNIT AREA  
LOWER AMARANTH SANDY UNIT



--- APPLICATION AREA FOR INCREASE IN  
MAXIMUM PERMISSIBLE PRODUCTION RATE



July 28, 1992

Kohaly and Elash  
Barristers and Solicitors  
1312 Fourth Street  
ESTEVAN, Saskatchewan  
S4A 2A5

Dear Mr. Elash:

**RE: PIERSON AREA DRILLING SPACING UNITS**

As per your request dated July 14, 1992, attached are copies of:

1. Board Order No. SU 6 pertaining to spacing in a portion of the Pierson Field (formerly the South Pierson Area) and a notice from the Oil and Natural Gas Conservation Board extending the aforementioned Order until it has completed disposition of spacing applications made by Home Oil Company Limited and Tundra Oil and Gas.
2. A copy of The Petroleum Drilling and Production Regulation including an invoice for the same.
3. Home Oil has not filed a well licence application with the Petroleum Branch in or adjacent to the NW/4 of Section 8-2-29 (WPM). The Branch in its review of a licence application considers the correlative rights of adjacent mineral owners to ensure such rights are not inequitably affected.

In the case of a vertical well, the regulations are designed to ensure correlative rights are protected. In the case of a horizontal well, the situation is not as clear cut. If the Branch has concerns, adjacent mineral owners would be notified directly and asked to comment on the application. If Home Oil applies for a horizontal well, I will contact you regarding the details of the application.

Page 2

If you have any questions, please contact me at (204) 945-6574.

Yours truly,

ORIGINAL SIGNED BY  
JOHN N. FOX

John N. Fox  
Chief Petroleum Engineer

JNF:sjk  
Encls.

# KOHALY AND ELASH *Barristers & Solicitors*

1312 FOURTH STREET  
ESTEVAN, SASKATCHEWAN  
S4A 2A5  
DRAWER 580

PAUL D. ELASH, B.A., LL.B.  
(Also Member of Manitoba Bar)  
DAVID G. KREKLEWICH, B. ADMIN LL.B.  
TIM McGEOUGH, B.A., LL.B.  
COUNSEL: ROBERT KOHALY, Q.C.  
TELEPHONE (306) 634-3631  
FAX (306) 634-6901

July 14, 1992

Department of Energy and Mines  
Petroleum Branch  
555-330 Graham Avenue  
Winnipeg, Manitoba  
R3C 4E3



Attn: Mr. John Fox

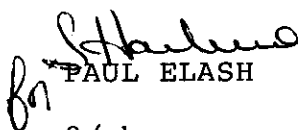
RE: Home Oil Limited proposed waterflood and horizontal well  
NE 8-2-29W1st  
Our File: 928527  
Our Clients - Beth Allison and Dr. Anne Boyd  
Registered Owners - NW 8-2-29W1st (Mines and Minerals)

In order to assist us in advising our clients, we would appreciate receiving the following information from you.

- (1) Copy of the Well Licence Application filed by Home Oil, if in fact it has been filed yet.
- (2) What are the spacing units in this area. In other words, are the drilling spacing units the normal single legal subdivision, or has there been a Special Drilling Spacing Unit Order? If so, could you kindly provide us with a copy of same.
- (3) Our clients have made certain enquiries with us concerning the provisions of the petroleum, drilling and production regulations, in connection with target areas, well licensing, etc. I have on my file a copy of the Petroleum, Drilling and Production Regulations, 1984, as published in volume 113, number 29, July 5, 1984 of The Manitoba Gazette. Do these regulations still apply? If they have been amended, could you kindly provide us with a copy of the revised regulations or alternatively advise how we may obtain such copy.

Thank-you for your assistance.

Yours truly,

  
PAUL ELASH

8/sh

p.c. Dr. Anne Boyd  
Beth Allison

2520 Renzoni Road  
Mississauga, Ontario  
L5K 1W9  
July 10, 1992



John Fox  
Chief Petroleum Engineer  
Petroleum Branch  
Manitoba Energy and Mines  
550-330 Graham Avenue  
Winnipeg, Manitoba  
R3C 4E3

Dear Mr. Fox:

Re: South Pierson Oil Field, NW1/4 8-2-29W

Thank you for seeing me yesterday and for the information about the South Pierson Oil Field which you provided. I found our meeting very helpful.

I am writing on behalf of my sister, Beth Allison of Elkhorn, Manitoba, co-owner with me of the mineral rights for the quarter section identified above. We have learned that Home Oil plans and is seeking permission to drill a horizontal well this summer from that quarter to the laterally adjacent unit. As offset owners, we have an obvious interest in Home's proposal and its implications.

We are asking therefore that you advise us of Home Oil's license application; we are particularly interested in the proposed location of the horizontal well.

Thank you very much.

Yours sincerely,

A handwritten signature in cursive script that reads "Ann Boyd".

Ann Boyd

cc: Beth Allison  
Belle Boyd  
Home Oil

June 2, 1992

Mr. R. Puchniak  
Tundra Oil and Gas Ltd.  
1313 Richardson Building  
One Lombard Place  
Winnipeg, Manitoba  
R3B 0X3

Dear Mr. Puchniak:

RE: Application for Continuation of 32 ha Spacing  
Pierson Area

The Board's review of applications received from Tundra and Home Oil Company Limited for approval of 32 hectare spacing in the Pierson area is continuing.

The Board has had ongoing discussions with Home Oil regarding that company's depletion strategy, development plans and the feasibility of waterflooding in the Pierson area. Home Oil plans to submit an application for a pilot waterflood/injectivity test in the Pierson Lower Amaranth C Pool before the end of June 1992.

The Board intends to defer final disposition of the 32 ha spacing applications until it has completed its review of the forthcoming application.

A review of individual well daily and cumulative oil production indicates that wells in the better portions of the Pierson Lower Amaranth C Pool are capable of effectively draining more than 16 ha, while wells near the edge of the pool are not. As indicated in your application, Tundra's wells in Section 22-2-29 (WPM) do not appear to be effectively draining 32 ha. Section 23-2-29 (WPM), while undrilled, is expected to have similar reservoir characteristics. Reservoir characteristics and production performance in these areas suggest 16 ha spacing is more appropriate from a maximum recovery standpoint.

In the application Tundra indicates the principal reason for requesting continuation of 32 ha spacing is that it is uneconomic to drill on 16 ha spacing for an incremental recovery of 1 500 m<sup>3</sup> /well (3.1% OOIP - Branch estimate).

The Board agrees that the economics of development on 16 ha spacing may not be attractive considering recent oil prices. However, continuation of 32 ha spacing will not maximize ultimate recovery in Sections 22 and 23 and may unnecessarily restrict development of these lands in the future, should economic conditions improve.

Based on the foregoing analysis, the Board is considering denial of your application of 32 hectare spacing in the Pierson Area. The Board requests Tundra provide its comments on the Board's position, as stated in this letter, before July 1, 1992. Also please comment on the company's development plans for Sections 22 and 23-2-29 (WPM). If you have any questions please contact L.R. Dubreuil, Director of Petroleum at 945-6573.

Yours respectfully,

ORIGINAL SIGNED BY  
H. CLARE MOSTER

H. Clare Moster  
Deputy Chairman

**Home Oil Company Limited**

1600 Home Oil Tower  
324 Eighth Avenue S.W.  
Calgary, Alberta T2P 2Z5  
Telephone (403) 232-7100  
Fax (403) 232-7678



June 11, 1992

Province of Manitoba  
Department of Energy and Mines  
Room 309, Legislative Building  
450 Broadway Avenue  
WINNIPEG, Manitoba  
R3C 0V8

**Attention: Mr. H. Clare Moster, Deputy Chairman**

Dear Sir,

**RE: Pierson Area  
Response to Board's Letter April 10, 1992**

Attached, please find a point by point response to the Board's letter dated April 10, 1992, regarding activity and details associated with the Pierson field.

Home Oil / Scurry-Rainbow have attempted to address all the concerns of the Board's letter, however, spacing issues require some further data analysis before finalizing. Home /Scurry concur with the statement from your letter dated May 29, 1992, that the Board hold final disposition of Home / Scurry's application for 32 hectare spacing and increased MPPR until the mapping and data associated with the pilot waterflood / injectivity test application have been reviewed.

It is our intention to discuss all items from the Board's letter and the upcoming pilot waterflood application with John Fox in our Calgary office on June 11, 1992.

If you have any question or require further clarification, please contact Curt Labelle at (403) 232-7457.

Sincerely,

**HOME OIL COMPANY LIMITED  
SCURRY-RAINBOW OIL LIMITED**

**G.C.K. Johnson, P. Eng.  
Coordinator, Southern Production**

CWL/cwl  
ATTACH.

June 11, 1992

Province of Manitoba  
Department of Energy and Mines  
Room 309, Legislative Building  
450 Broadway Avenue  
WINNIPEG, Manitoba  
R3C 0V8

**Attention: Mr. H. Clare Moster, Deputy Chairman**

Dear Sir,

**RE: Pierson Area**  
**Response to Board's Letter April 10, 1992**

cc: G.C.K. Johnson / J.H. Olthof / File  
D. A. Cairns  
J. S. Murray  
Day File



Pursuant to the letter from H. Clare Moster, Manitoba Energy and Mines dated April 10, 1992, Home Oil Company Limited / Scurry-Rainbow Oil Limited respectfully submit the following responses to the crown queries as outlined below:

### **Hydrocarbon Pore Volume and Permeability Capacity Maps**

The above noted maps are ~~are~~ currently being updated to include the data received from the 06-08, 14-18, and 10-16-002-29 W1M wells drilled in the spring of this year. These maps will be completed and forwarded to the crown by July 1, 1992. Subsequent drilling in the summer of 1992 will likely result in further modifications.

### **Current and Ultimate Recovery Estimates**

As outlined in the "South Pierson Preliminary Waterflood Study", the recoverable oil from the designated "Project Area" under primary drive is estimated at 504,612 m<sup>3</sup> or 7.2% of the original oil in place. The estimated recoverable reserves under waterflood are 2,240,000 m<sup>3</sup> or 32%. The ultimate recoverable reserves are those of the waterflood scenario at this time.

### **Development Drilling Plans**

Home/Scurry intends to drill between three (3) and five (5) vertical wells (to complete 32 hectare well spacing in the majority of the waterflood area) and one (1) horizontal test well in the summer of 1992. These wells are supplementary to the three (3) commitment wells drilled earlier this year. Development drilling on 16 hectare well spacing to initiate the waterflood will likely begin in 1993 depending on proprietary budget and corporate status.

### **Effect of forced 16 hectare spacing on Home/Scurry**

Material balance evaluation of primary production suggest that 32 hectare spacing is effective drainage in most of the Pierson Field. Forced 16 hectare spacing in the field will accelerate production but negatively impact the economics under primary production. Future development in the Pierson field is focused on waterflood implementation in the near term which will require 16 hectare spacing.

### **Economics of 16 Hectare Spacing**

In certain peripheral areas of the field effective drainage zones may approach 16 hectares. In these cases oil production is incremental rather than accelerated as 32 hectare well spacing can not physically produce the oil in place. The expected production from a 16 hectare spacing unit is around 5,000 m<sup>3</sup>. Economic indicators using 16 hectare well spacing, 5,000 m<sup>3</sup> of R.O.I.P., 2.5 m<sup>3</sup>/d initial production and Home Oil corporate price forecast do not meet the required Home/Scurry threshold and are as follows:

AIT NPV (@ 12%):	\$2,900	
AIT ROR:	12.4%	21/661
AIT Payout:	4.4 years	

### **Recovery Strategy for Mission Canyon Reserves**

It is Home/Scurry's intention to exploit Mission Canyon reserves whenever possible through hydraulic fracture communication since stand alone economics for MC3 production are not favourable. Although Home/Scurry field development is focused specifically on successfully flooding the Lower Amaranth, efforts will be made to identify underlying Mission Canyon oil pay

and development infill well completions will be adjusted accordingly.

- expiry of  
MC rights on  
Crown land

### Economics of Mission Canyon Drilling

Home / Scurry have completed three (3) Mission Canyon wells that were marginal producers with an average of 1.5 m<sup>3</sup>/d. Stand alone economics for Mission Canyon development are not favourable. Unrisked economic indicators using 32 hectare well spacing and Home Oil corporate price forecast, for crown and freehold lands are as follows:

7200 m <sup>3</sup> recovery	<u>CROWN</u>	<u>FREEHOLD</u>
AIT NPV (@ 15%):	-\$34,700	-\$55,300
AIT ROR:	11.7 %	9.5 %
AIT Payout:	7.3 years	8.1 years

### Possible 16 Hectare Spacing in Mission Canyon

Home /Scurry's development strategy is primarily focused on waterflooding the Lower Amaranth and stand alone Mission Canyon development is not considered favourable, therefore, 16 hectare well spacing for Mission Canyon is irrelevant. However, 16 hectare well spacing will be required for the waterflood scheme and Home / Scurry will attempt to identify and tap Mission Canyon resources as part of the infill drilling and completions program.

### Need for Continuation of 14 m<sup>3</sup>/d (360 m<sup>3</sup>/mo) MPPR

Recent changes in completion practice in the Pierson field have yielded higher than expected production rates from two (2) of the recently drilled commitment wells (14-18 & 06-08-002-29 W1M). The production increase appears to be the result of lowered near wellbore relative permeability damage by use of gelled diesel rather than produced water in the hydraulic fracture stimulations. These wells are presently producing around 12 m<sup>3</sup>/d which is less than capacity and since this is a new practice, it is uncertain as to the longevity of these rates. Home / Scurry prefers to continue producing under the increased MPPR of 14 m<sup>3</sup>/d (360 m<sup>3</sup>/mo). With stabilized production data in the near future, Home /Scurry will be in a better position to ascertain whether the 500 m<sup>3</sup> allowance for initial over-production is sufficient to cover the wells at the lower MPPR of 9.5 m<sup>3</sup>/d (240 m<sup>3</sup>/mo). Expedited flush zone production from Pierson wells can add significant value and is a key economic consideration. *Very sensitive*

AMPLD INTEREST  
IN 512-9

### Response to D. Southam's Well Spacing Concerns

Home /Scurry has addressed the concerns of freehold land owner D. Southam regarding well spacing in the Pierson field suggesting that 32 hectare well spacing for primary production in most areas was justifiable. It was also mentioned that field development was being directed towards waterflooding which will realize the best ultimate recovery of Lower Amaranth reserves and dictate the optimum well spacing. The letter, issued May 15, 1992 is attached for your perusal. *512-17*

### Pressure Data for 1991 and 1992 Pressure Survey

The analyzed data for the 1991 pressure work conducted in the Pierson field was sent out on May 26, 1992. The letter outlined various concerns associated with the extrapolated pool pressures from the pressure build-up tests and suggested that RFT's from infill drilling programs may provide better pressure data for the 1992 pressure survey. The use of RFT's would also eliminate the prohibitively long shut-in periods of many months required to recover analysable data from the build-ups. This item can be further discussed separately. ✓

RFT - \$4500

2 more pressure surveys  
under review.

## Designated Exclusion Lands from the 32 Hectare Spacing Approval

Home/Scurry generally concur with the crown that some of the lands outlined in the present "Well Spacing Application Area" may not be fully draining 32 hectares. However, with the present mapping control, Home/Scurry is not satisfied that infill drilling in these locations can yield economic production. Reduction in well spacing therefore will not likely lead to increased development of these lands. Home / Scurry recommends that the mapping to be completed by July 1, 1992 be used to make a formal submission to the crown as to the designation of 32 and 16 hectare well spacing lands within the "Application Area".

SW 1/4 - Sec 29 expired

WF Pilot Project

16-8 injection for pilot  
pipeline from battery

→ apply under SWD for temporary approval

→ meeting with landowner 2 wks.

→ Natural Resources → contacted Don T.

→ 16-8 highest recovery, contained within the  
higher GOR, close to battery



May 15, 1992

**Mr. Dong Southam**  
**P.O. Box 243**  
**Melita, Manitoba**  
**R0M 2T0**

Dear Mr Southam:

Re: Home Oil Company Limited  
Application for 32 ha Drilling Spacing Units  
Pierson Area - Board Order No SU6

HAD CONSERVATION  
WITH SOUTHAM

Further to our telephone conversation of April 28, 1992 I have been requested to ask that you contact the Manitoba Oil and Natural Gas Conservation Board with regards to your objection to our 32 ha drilling spacing unit application and inform them whether or not that you are prepared to withdraw your November 11, 1991 objection.

During our first conversation in January 1992, I stated that Home Oil was performing a full scale technical review/study of the Pierson field. With this study now completed, it is felt that in a majority of the field we are indeed draining the prescribed 32 ha drilling spacing unit, however as I mentioned, we are preparing to perform a small waterflood pilot project this summer. This pilot project will significantly improve the ultimate oil recovery ( primary vs. secondary ) as well as dictate the proper well spacing for this Enhanced Oil Recovery scheme within this Lower Amaranth formation.

If you have any questions or require additional information, please contact the undersigned at (403) 232-7337.

Yours truly,  
Scurry Rainbow Oil Limited

  
D.A. Cairns, Area Engineer  
Southern Operations District

cc:

D. R. Meadows  
J. N. Fox ( Manitoba Oil and Gas Conservation Board )  
Day File

**Home Oil Company Limited**

1600 Home Oil Tower  
324 Eighth Avenue S.W.  
Calgary, Alberta T2P 2Z5  
Telephone (403) 232-7100  
Fax (403) 232-7678



May 15, 1992

Mr. Doug Southam  
P.O. Box 243  
Melita, Manitoba  
R0M - 1L0

Dear Mr Southam:

Re: Home Oil Company Limited  
Application for 32 ha Drilling Spacing Units  
Pierson Area - Board Order No SU6

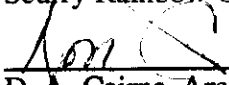


Further to our telephone conversation of April 28, 1992 I have been requested to ask that you contact the Manitoba Oil and Natural Gas Conservation Board with regards to your objection to our 32 ha drilling spacing unit application and inform them whether or not that you are prepared to withdraw your November 11, 1991 objection.

During our first conversation in January 1992, I stated that Home Oil was performing a full scale technical review/study of the Pierson field. With this study now completed, it is felt that in a majority of the field we are indeed draining the prescribed 32 ha drilling spacing unit, however as I mentioned, we are preparing to perform a small waterflood pilot project this summer. This pilot project will significantly improve the ultimate oil recovery ( primary vs. secondary ) as well as dictate the proper well spacing for this Enhanced Oil Recovery scheme within this Lower Amaranth formation.

If you have any questions or require additional information, please contact the undersigned at (403) 232-7337.

Yours truly,  
Scurry Rainbow Oil Limited

  
\_\_\_\_\_  
D. A. Cairns, Area Engineer  
Southern Operations District

cc:

D. R. Meadows  
J. N. Fox ( Manitoba Oil and Gas Conservation Board )  
Day File



The Oil and Natural Gas  
Conservation Board

Room 143  
Legislative Building  
Winnipeg, Manitoba, CANADA  
R3C 0V8

(204) 945-3130  
FAX: (204) 945-0586

May 29, 1992

Mr. J.H. Olthof, Manager  
Southern Production  
Home Oil Company Limited  
1600 Home Oil Tower  
324 - 8th Avenue S.W.  
Calgary, Alberta  
T2P 2Z5

Dear Mr. Olthof:

RE: Pierson Lower Amaranth Waterflood Study

This letter is to acknowledge receipt of Home's report entitled "South Pierson Preliminary Waterflood Study - Lower Amaranth Pool". The Board shares Home Oil's concerns that a pressure maintenance scheme be implemented in the Lower Amaranth Formation in the Pierson Field as soon as possible, to ensure ultimate recovery is maximized.

It is the Board's understanding that Home Oil will be submitting an application for approval of a pilot waterflood/injectivity test by the end of June, 1992. The application will also address the questions and concerns outlined in the Board's letter dated April 10, 1992.

The Board will hold final disposition of Home Oil's applications for continuation of 32 ha spacing and increased maximum permissible production rate restrictions until it has completed its review of the forthcoming pilot waterflood/injectivity test application.

If you have any questions in respect of this matter, please contact L.R. Dubreuil, Director of Petroleum or John N. Fox, Chief Petroleum Engineer at (204) 945-6573 or 945-6574, respectively.

Yours respectfully,

A handwritten signature in black ink, appearing to read "H. Clare Moster". The signature is fluid and cursive, with a long horizontal stroke extending to the right.

H. Clare Moster  
Deputy Chairman

May 29, 1992

The Oil and Natural Gas  
Conservation Board  
- Ian Haugh, Chairman  
- H. Clare Moster, Deputy Chairman  
- Wm. McDonald, Member

John N. Fox  
Chief Petroleum Engineer  
Petroleum Branch

RE: Home Oil Company Limited  
Pierson Lower Amaranth Waterflood Study

Home Oil Company Limited has submitted a waterflood study for the Lower Amaranth Formation in the Pierson Field. The study provides the technical support for a pilot waterflood/injectivity test the company is planning to conduct in mid-1992. Home plans to submit an application for approval of the pilot waterflood/injectivity test before the end of June, 1992. The application will also address the questions and concerns listed in the Board's deficiency letter (April 10, 1992).

#### RECOMMENDATIONS

It is recommended that disposition of Home's applications for continuation of 32 ha spacing and increased MPPR restrictions be held until the pilot waterflood/injectivity test application is reviewed.

Attached is the proposed Board letter acknowledging receipt of the waterflood study and indicating the Board will hold final disposition of the applications.

#### DISCUSSION

Home Oil has reviewed the primary production performance of the Lower Amaranth in the "Project Area" outlined in Figure 1. The company also reviewed the waterflood potential of the Lower Amaranth in the "Waterflood Area" outlined in Figure 1. Table 1 lists Home's primary and secondary recovery estimates.

The primary recovery estimate of 7.2% OOIP is based on fully developing the central portion of the "Project Area" on 32 ha spacing by drilling an additional 50 wells over the next seven years (Figure 1). Home believes the underlying MC 3 zone is in communication with the Lower Amaranth through hydraulic fractures and may contribute as much as 28% of the recoverable

reserves. The study does not address primary performance on 16 ha spacing.

The study also indicated some wells in the pool are experiencing increasing GOR's indicative of reservoir pressure below the bubble point in the immediate vicinity of the wellbore. Home estimates the majority of the wells will reach the bubble point in 1-3 years. Though the average reservoir pressure is still above the bubble point, there is a need to implement pressure maintenance in the Lower Amaranth in the not too distant future.

Home's waterflood recovery estimate of 32% OOIP is based on developing the "Waterflood Area" on 16 ha spacing (over 100 undrilled spacing units). The company plans to utilize 5-spot injection patterns to ensure adequate injectivity is achieved and waterflood recovery is accelerated. The estimated areal sweep for the waterflood is 84%. Home is also reviewing the technical and economic feasibility of using horizontal injectors. If the reservoir pressure drops below the bubble point before the waterflood is commenced, reservoir fill-up will take longer and the waterflood response will be delayed. Home feels there will be little effect on ultimate recovery but there will be a negative impact on project economics.

The waterflood is anticipated to perform in a manner similar to the Waskada Lower Amaranth waterfloods, with pressure maintenance reducing the annual production decline from 22% /yr. to less than 1% /yr.

Home's estimated capital expenditures to implement the waterflood is \$30MM over the next 5-6 years including development drilling costs. The company's economics are "favourable but marginal" with a 28% rate of return (A/T) and a 7 year payout.

ORIGINAL SIGNED BY  
JOHN N. FOX

John N. Fox

Approved:

\_\_\_\_\_  
L.R. Dubreuil, Director



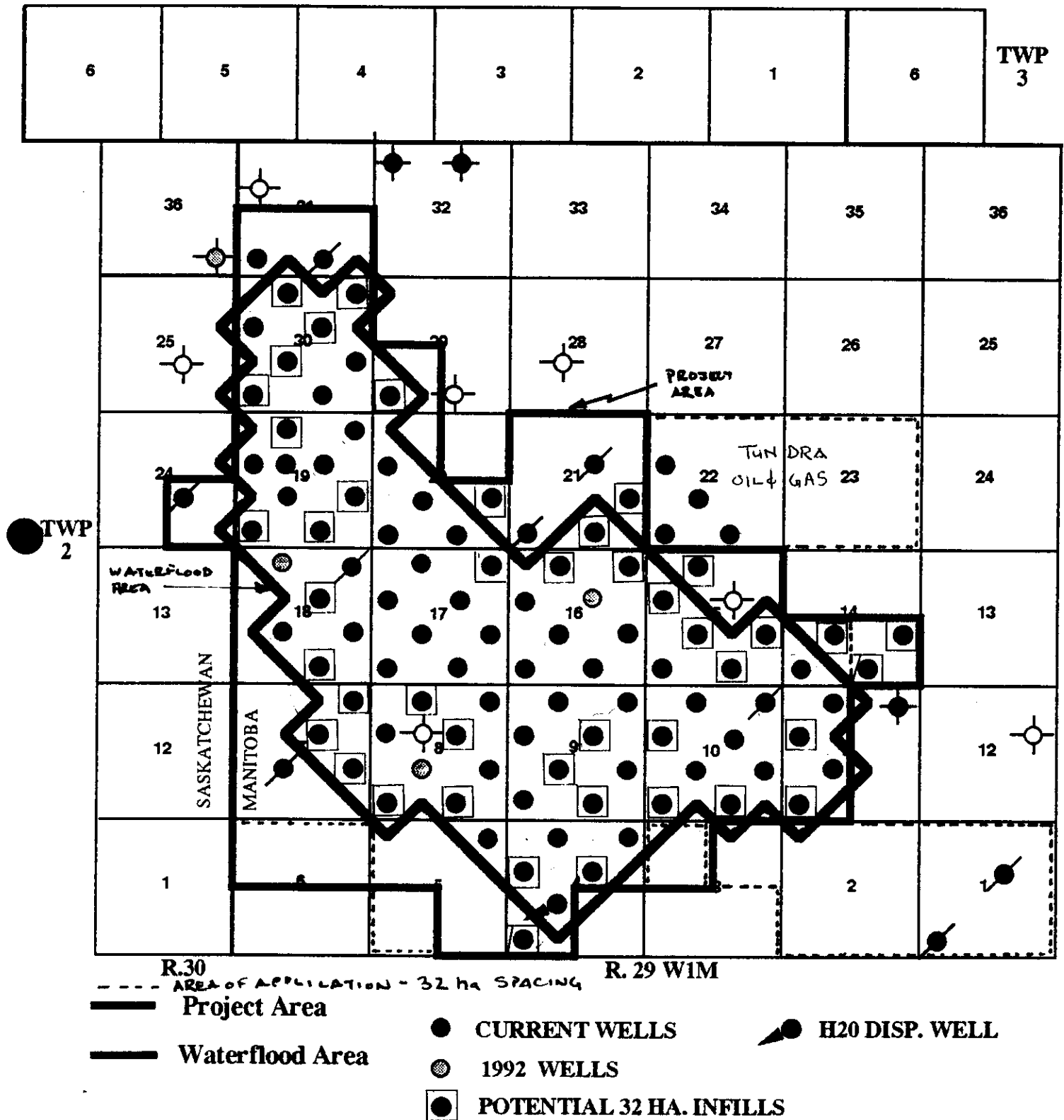
TABLE 1

PIERSON LOWER AMARANTH FORMATION  
PRIMARY AND SECONDARY RECOVERY

Original Oil-in-Place ( $10^3\text{m}^3$ )	7000
Recoverable Reserves	
Primary ( $10^3\text{m}^3$ )	504 (7.2% OOIP)
Secondary ( $10^3\text{m}^3$ )	2240 (32% OOIP)

Figure 1.0

# SOUTH PIERSON AREA



April 10, 1992

Mr. Jan Olthof, P. Eng.  
Manager, Southern Production  
Home Oil Company Limited  
1600 Home Oil Tower  
324 - 8th Avenue S.W.  
Calgary, Alberta  
T2P 2Z5

Dear Mr. Olthof:

RE: Pierson Area  
Applications for Special Drilling Spacing Units and  
Increase in Maximum Permissible Production Rate Restrictions

The Board has reviewed the information filed by Home Oil in support of the subject applications including the material presented to the Petroleum Branch at the February 20, 1992 meeting. The Board requests that Home provide comments in respect of the following aspects of the applications:

#### AREA OF APPLICATION

Home has drilled 55 wells in the area of application over the last seven years. There remain 82 undrilled 32 ha spacing units. Over the last year Home has released five (5) quarter sections within the boundaries of Board Order No. SU6. In addition in 1992, Home is facing Crown and freehold lease expiries on another 3 1/2 sections within the area of application.

A review of individual well daily and cumulative oil production indicates that wells within the better portions of the reservoir are probably capable of effectively draining more than 16 ha, while wells near the edges of the reservoir are not. In order to determine the appropriateness of 32 ha spacing for all lands within the area of application, the Board requests that Home submit the following:

- ✓(a) A  $\phi$ h or hydrocarbon pore volume map for the area of application;

- ✓(b) Current and ultimate primary recovery estimates for all wells within the area of application. This information can be presented on a table or map; and
- ✓(c) Home's plans to develop undrilled 32 ha spacing units within the area of application.

How would denial of 32 ha spacing on the lands highlighted on Figure 1 impact Home's development plans for the Pierson Area? ←

#### 16 HA SPACING - INCREMENTAL RECOVERY

In the Board's letter of approval accompanying Board Order No. SU5 (October 1989), Home was asked to review the economics of developing the Lower Amaranth on 16 ha spacing, paying particular attention to determination of the level of incremental recovery associated with reduced spacing. This information has not been filed with the application.

A review of previously filed economics indicate the feasibility of 16 ha spacing is dependent on the level of incremental recovery, oil prices and capital cost. Please provide the Board with updated reduced 16 ha spacing drilling economics including Home's estimate of incremental recovery on 16 ha spacing.

NOT  
DONE

#### MISSION CANYON DEPLETION STRATEGY

Home presently does not operate any wells completed in the Mission Canyon Formation in the Pierson Field. Other operators in the Pierson Field are commingling Lower Amaranth and Mission Canyon production. What is Home Oil's strategy for recovering Mission Canyon reserves? Please comment on the economics of stand alone Mission Canyon development drilling.

There are presently eleven (11) Mission Canyon pools in the Pierson Field, all developed on 16 ha spacing. The small size of the pools and geological variability of the Mission Canyon appears to lend itself to development on 16 ha spacing. Please comment on this statement.

#### MAXIMUM PERMISSIBLE PRODUCTION RATE (MPPR) RESTRICTIONS

The Board has reviewed production in the area of application. In the 4th quarter of 1991, no wells produced significantly more than the MPPR of 9.5 m<sup>3</sup> /d and 240 m<sup>3</sup> /month set out in Schedule D of the regulations.

The Board questions the need for continuation of an MPPR of 14 m<sup>3</sup> /d and 360 m<sup>3</sup> /month as approved under Board Order No. 80A during continued primary depletion of the Lower Amaranth. If a pressure maintenance scheme is implemented in the Lower Amaranth, MPPR restrictions would, upon application and in the absence of equity or conservation concerns, be waived for the waterflood area.

→ PROPOSED TO DENY

The Board requests Home comment on the need for continuation of increased MPPR's in the Pierson area.

OTHER MATTERS

- (a) What is the status of discussions with Mr. Southam regarding the concerns he raises in his objection to continuation of 32 ha spacing (refer to Board's letter of December 19, 1991)? - FURTHER DISCUSSIONS
- (b) Home indicated the current reservoir pressure in the Pierson Lower Amaranth C Pool is approximately 9000 kPa. The last pressure data the Board has on file is from late-1990. Please provide a copy of the results of any pressure surveys taken in 1991 and Home's pressure survey plans for 1992.

PLANS -

The Board does not intend to complete disposition of the subject applications until it receives and completes its review of the pressure maintenance application Home has indicated it will be submitting in May 1992. If you have any questions in respect of this matter please contact L.R. Dubreuil, Director of Petroleum, or John N. Fox, Chief Petroleum Engineer, at (204) 945-6573 or 6574, respectively.

Yours respectfully,

ORIGINAL SIGNED BY  
H. CLARE MOSTER

H. Clare Moster  
Deputy Chairman

FIGURE NO. 1

Twp 02

SASKATCHEWAN  
MAN

Pierson

AREA OF APPLICATION

TUNDRA OIL & GAS LTD.

256



LANDS CONSIDERED FOR EXCLUSION  
FROM 32 ha SPACING APPROVAL

April 10, 1992

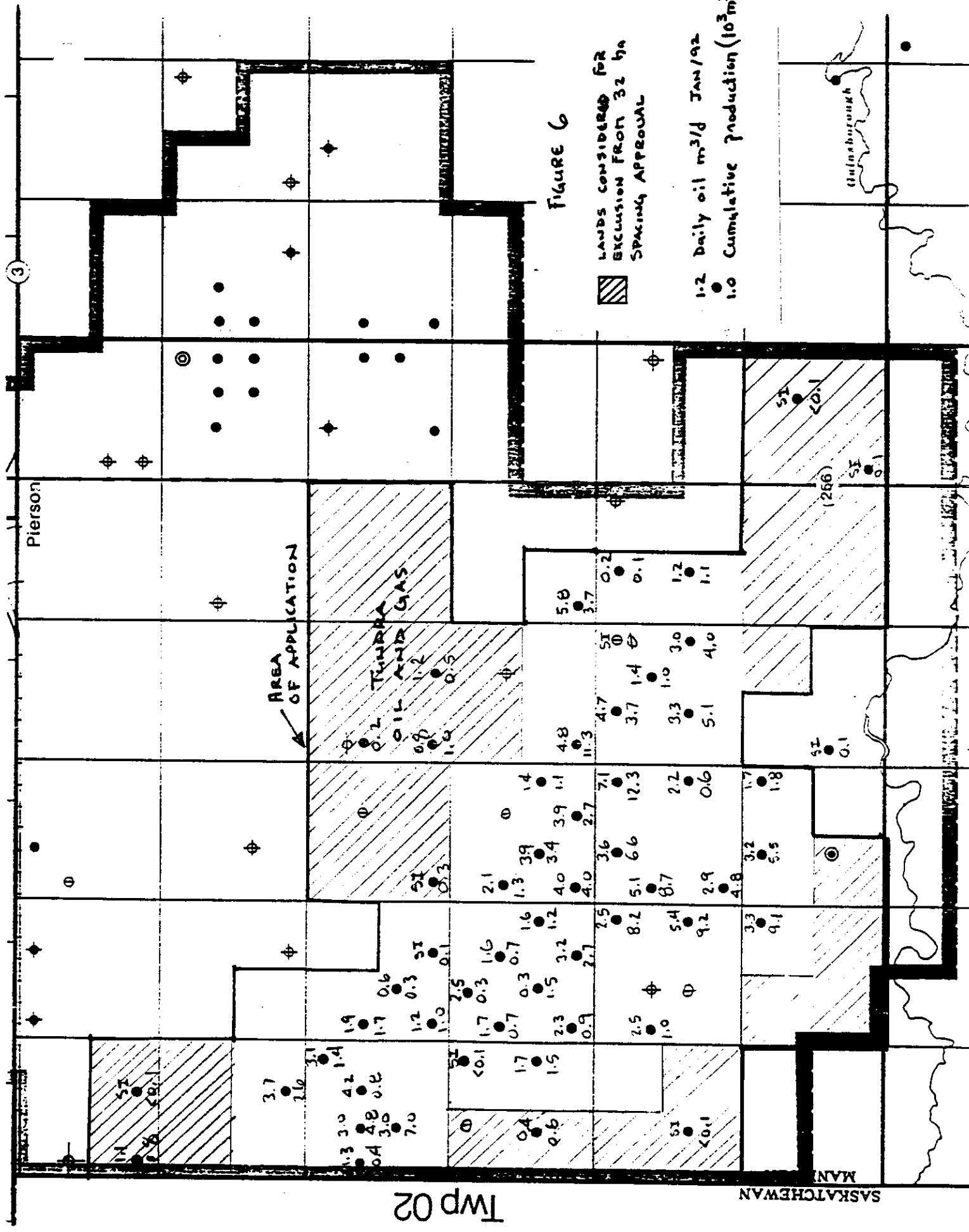
H. Clare Moster  
Deputy Chairman  
The Oil and Natural Gas  
Conservation Board

John N. Fox  
Chief Petroleum Engineer  
Petroleum Branch

The criteria used for the preliminary screening of lands to be included for 32 ha spacing was done on a 1/4 section basis. For a 1/4 section to be included, it has to contain a well with estimated primary ultimate recoverable reserves of 5000 m<sup>3</sup>. Assuming a pool average decline rate of 7% /yr, a minimum productivity of 1.2 m<sup>3</sup> /d (January 1992) and cumulative productivity of 1000 m<sup>3</sup> (January 31, 1992) is required. If an undrilled 1/4 section was laterally adjoined by two (2) 1/4 sections meeting the criteria, the undrilled 1/4 section was considered prospective and included.

ORIGINAL SIGNED BY  
JOHN N. FOX

John Fox





# HONE DEFICIENCY LETTER 92-04-10

## AREA OF APPLICATION

- under primary depletion HOC plans to drill approximately 54 well on 32 ha spacing locations over the next 7 years  
1992-4      1995-7      1998-14  
1993-7      1996-5  
1994-8      1997-9
- Home "Project Area" and "Waterflood Area" are shown in Attachment 1. HCPV and % Recovery maps are also shown to illustrate which lands the company feels are perspective.
- under waterflooding the area could be developed on 16 ha spacing - pilot 1/4 sec waterflood, injectivity test in 1992
- Fig 2 shows 32 ha spacing area superimposed with HOC's "Project Area" and "Waterflood Area"
- HOC is undertaking a review of MC
- HOC feels fluid influx from MC has accounted for 28% of oil production to date - the influx was estimated based on Tracy-Tarver material balance <sup>volume</sup> ~~injection~~ reservoir depletion prediction model indicated a recovery to bubble pt of 94,318 - <sup>3</sup>, actual recovery to date is 130,787 the difference 36,469 - <sup>3</sup> is attributed to MC

How indicates MCLM should be produced  
concurrently → does different spacing impact --  
this

MPRR not addressed - however concerns that  
certain portions of the reservoir are below bubble pt. suggest MPR will  
not be approved

# QUESTIONS FOR HOC - RE: DEFICIENCY LETTER + WATERFLOOD STUDY

1. nc  $\rightarrow$  28% of oil production, what % of oil prod. <sup>most  $\pm 90\%$</sup>  degree of pressure support, <sup>marginal</sup> ooip nc plans to complete & commingle in wellbore
  - sw low transient zone some lower Amaranth water production
2. which areas of the reservoir are experiencing increased GOR, planned pressure surveys  
RFT data on 1992 wells  $\rightarrow$  maintain high reservoir pressure  
low k should reduce fugacity  
- RFT's on 32 ha infill locations \$4000 / well
3. Primary Production Random Scenario involves developing the <sup>essentially</sup> waterflood area on 32 ha spacing
  - did HOC review development on 16 ha spacing under primary production, incremental recovery, economics, & evaluation only
  - marginal incremental recovery on 16 ha spacing  
NE-SW permeability trend observed, oblong drainage area, individual well drainage 32 ha <sup>less variable</sup>

4. EXCLUSION OF FRINGE AREAS OF POOL FROM  
32 ha spacing - COMMENTS

5. WATERFLOOD PROJECT → DRILL 16 ha injectors  
TABLE 8 REVIEWED 8 ha spacing → accelerates  
recovery → economies  
poor

→ how will WF be implemented  
- & injectivity test

unitization may help let me know

- economic - for free mineral holding oil  
Volume 8 130 L<sup>3</sup>, infill wells receives  
1550 L<sup>3</sup>

- what effect on recovery does late  
implementation of the waterflood have → little effect  
on ultimate recovery, delays WF response negatively impacts  
economics

- PILOT PROJECT

- INJECTIVITY TEST 16 ha only

- HORIZONTAL WELL FOR INJECTOR - increased injectivity  
- possibly re-entry

- see 849 complete 32 ha location - (5-10 wells) 1992

- freehold mineral owner concerns to be addressed

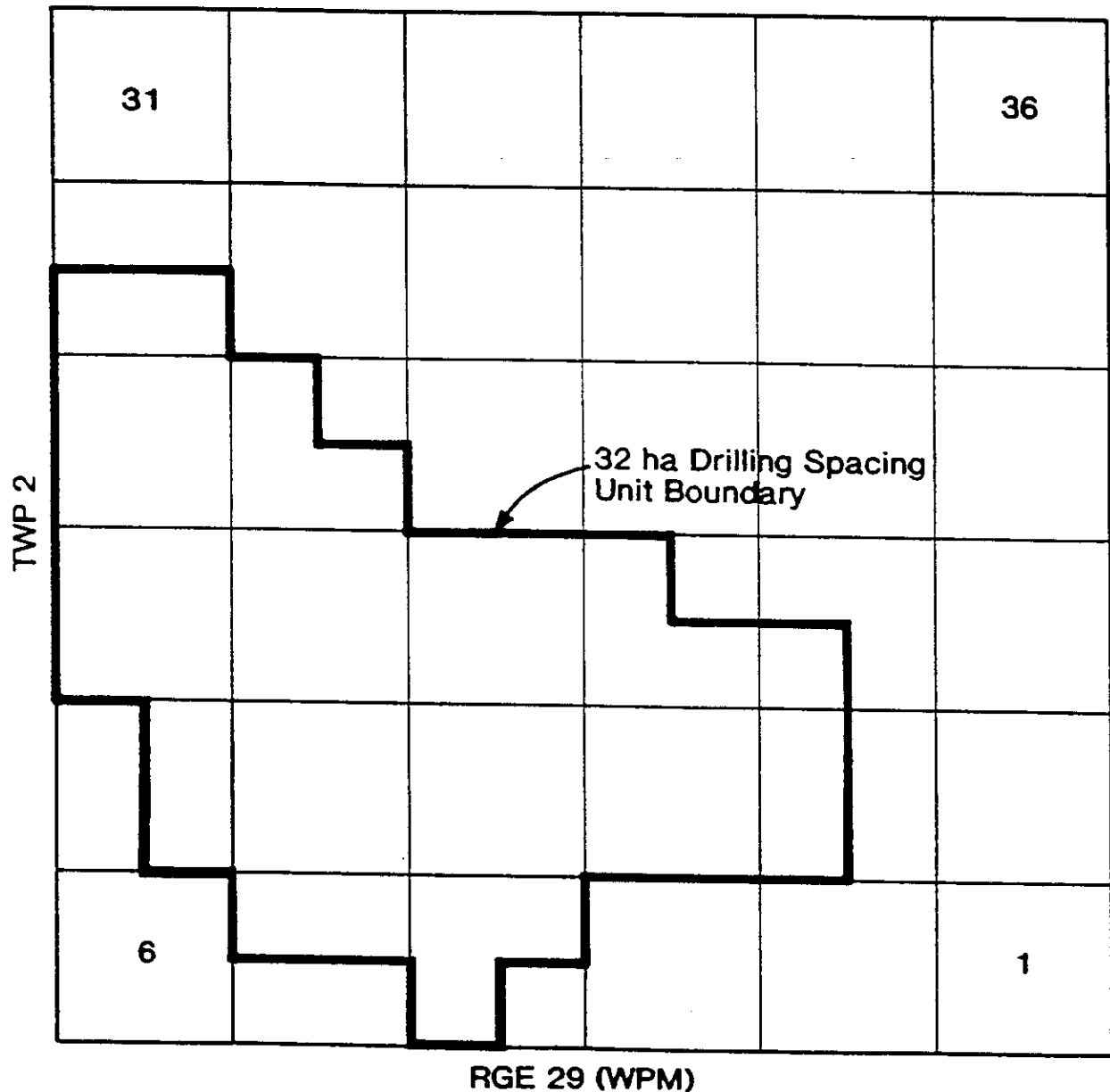
- JUNE 15 → application - for pilot WF will address  
deficiencies letter (6 month test)

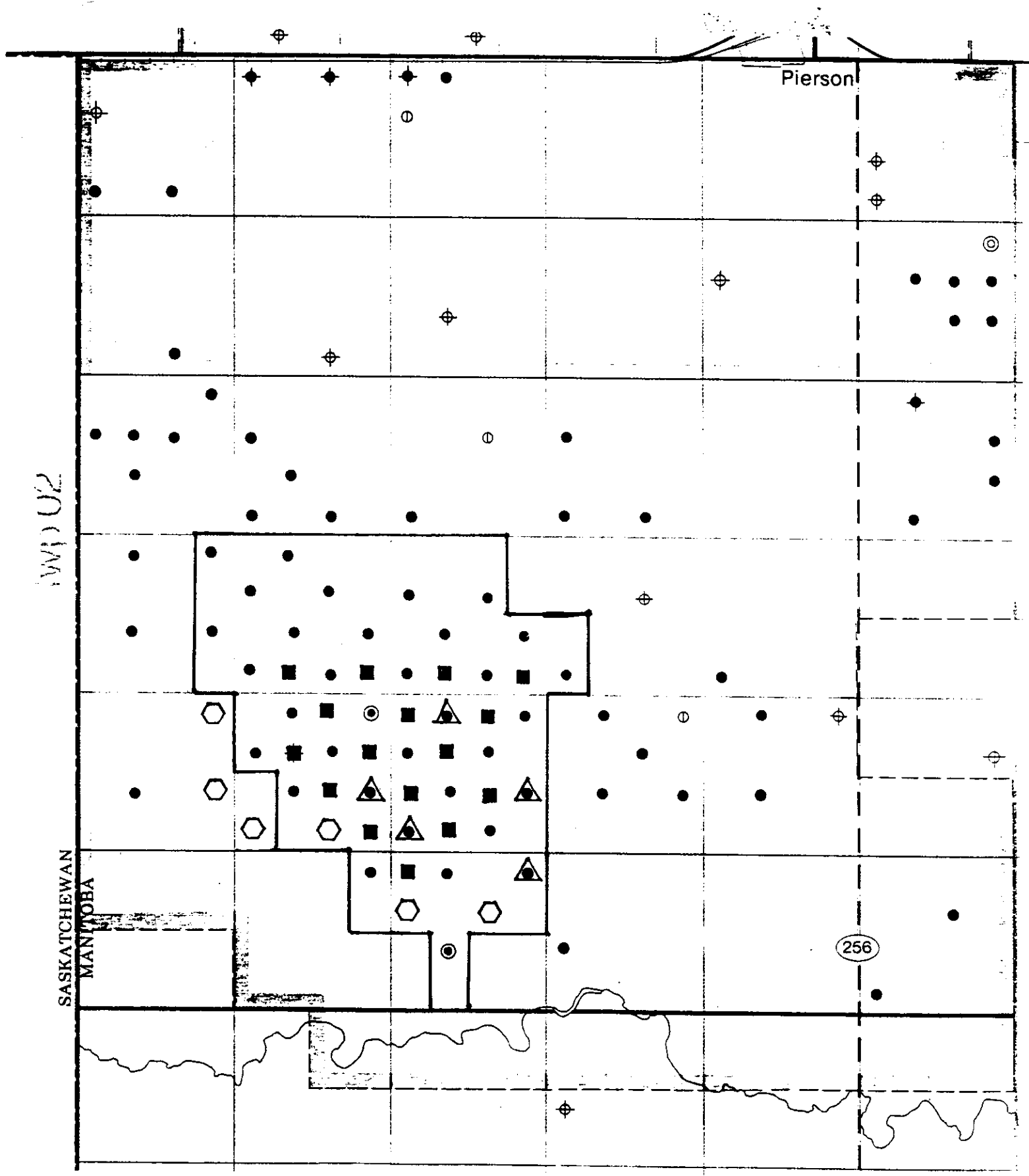
- conversion of existing producers.
- will try to exploit new oil

- DIESEL FRACTURES ON 1992 WELLS REDUCE DAMAGE  
AND HIGH INITIAL PRODUCTIVITY, 500 L<sup>3</sup> OVER-PRODUCTION  
WILL HELP

**BOARD ORDER NO. SU 9  
SCHEDULE A**

**PIERSON AREA  
32 ha DRILLING SPACING UNITS  
LOWER AMARANTH AND MISSION CANYON FORMATIONS**





WP 02

Pierson

SASKATCHEWAN  
MANITOBA

256

1993 32 ha LOCATIONS

○ 1993 32 ha LOCATIONS

Wp 02

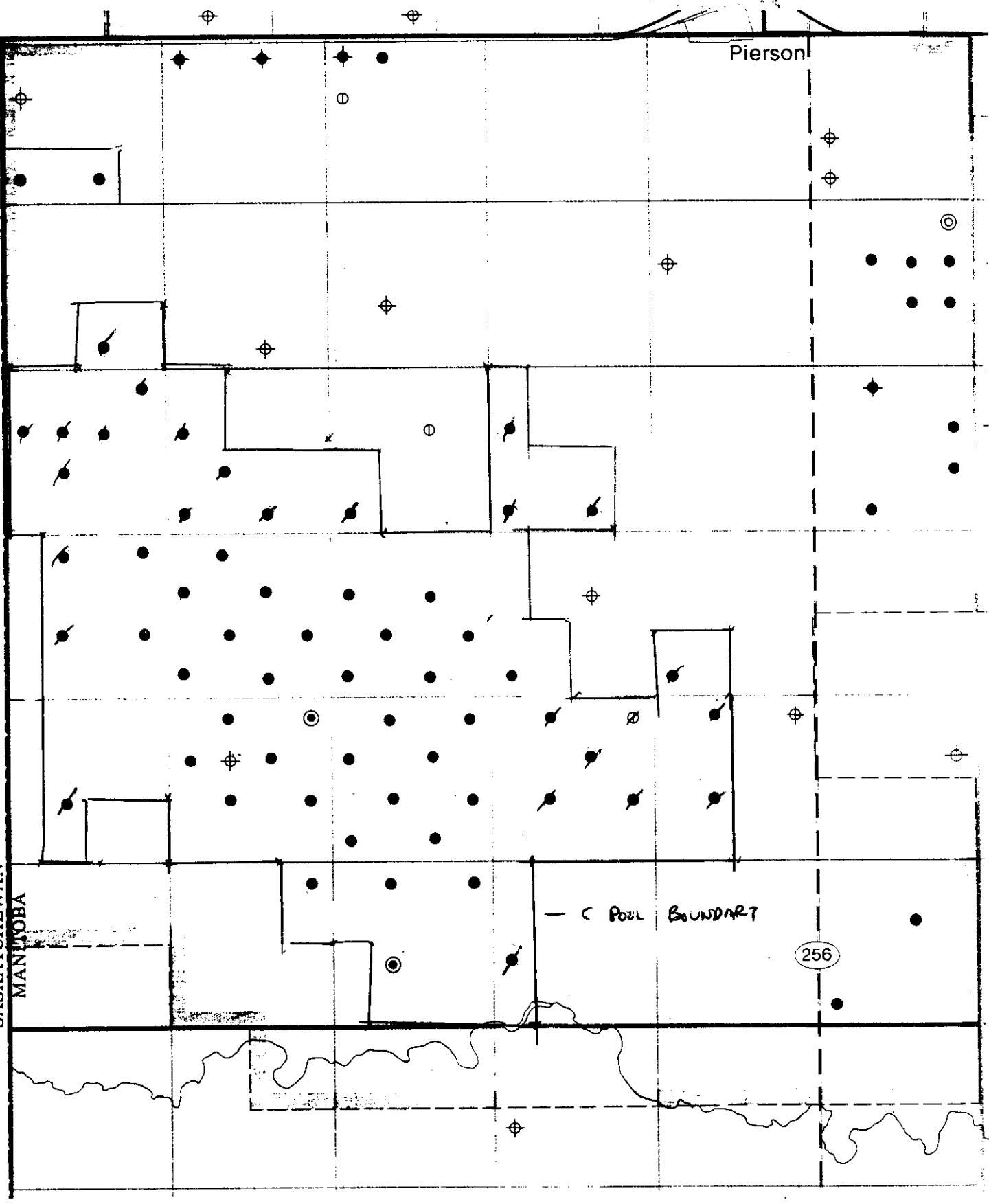
SASKATCHEWAN  
MANITOBA

Pierson

- C POOL BOUNDARY

256

OUTSIDE PROJECT AREA





WPD U2

Pierson

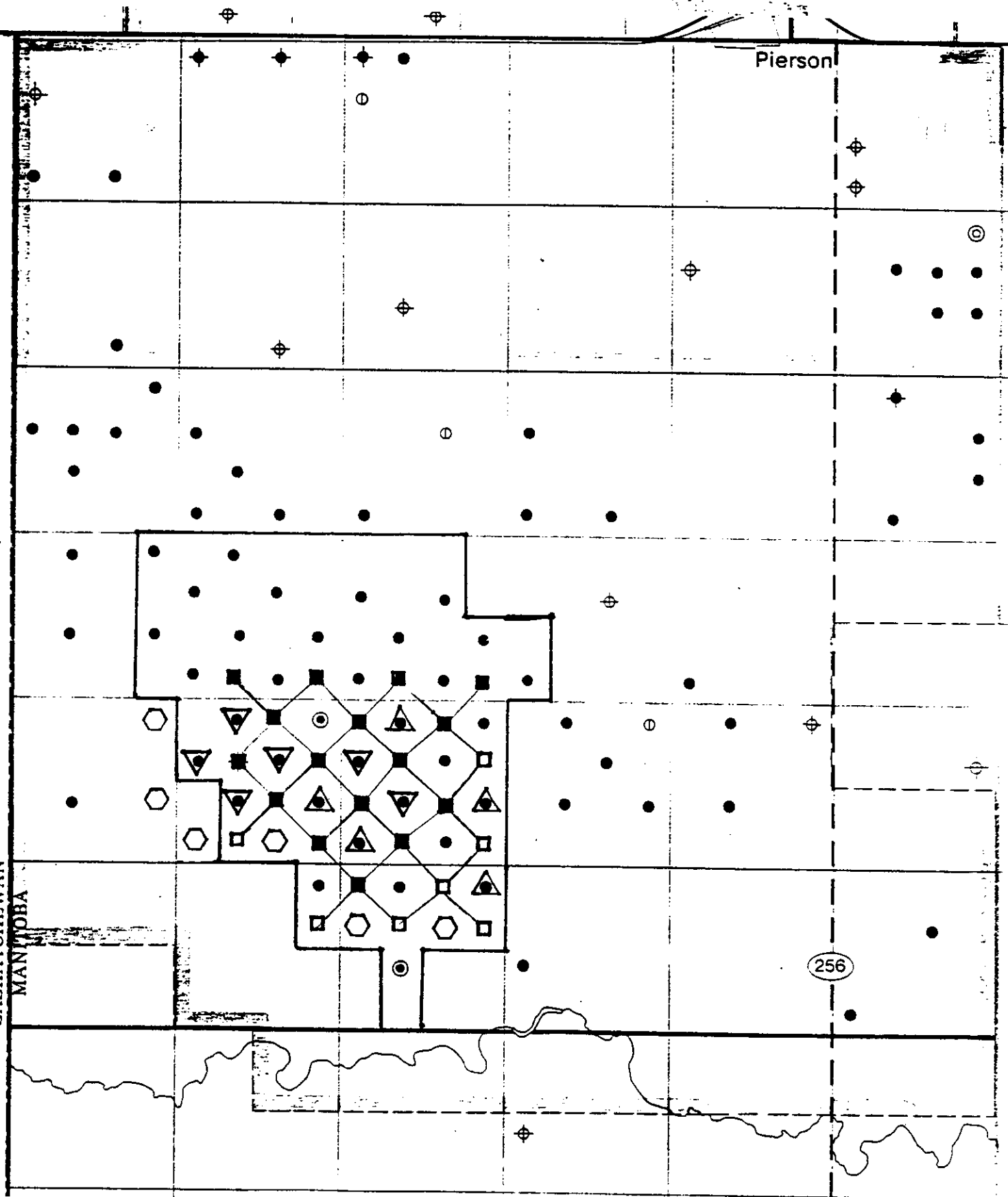
SASKATCHEWAN  
MANITOBA

256

- INFILL DRILLING FALL/93
- INFILL DRILLING WINTER/94
- 1993 32 ha LOCATIONS

△ CONVERSIONS FALL/93

▽ CONVERSIONS WINTER/94



WPD 02

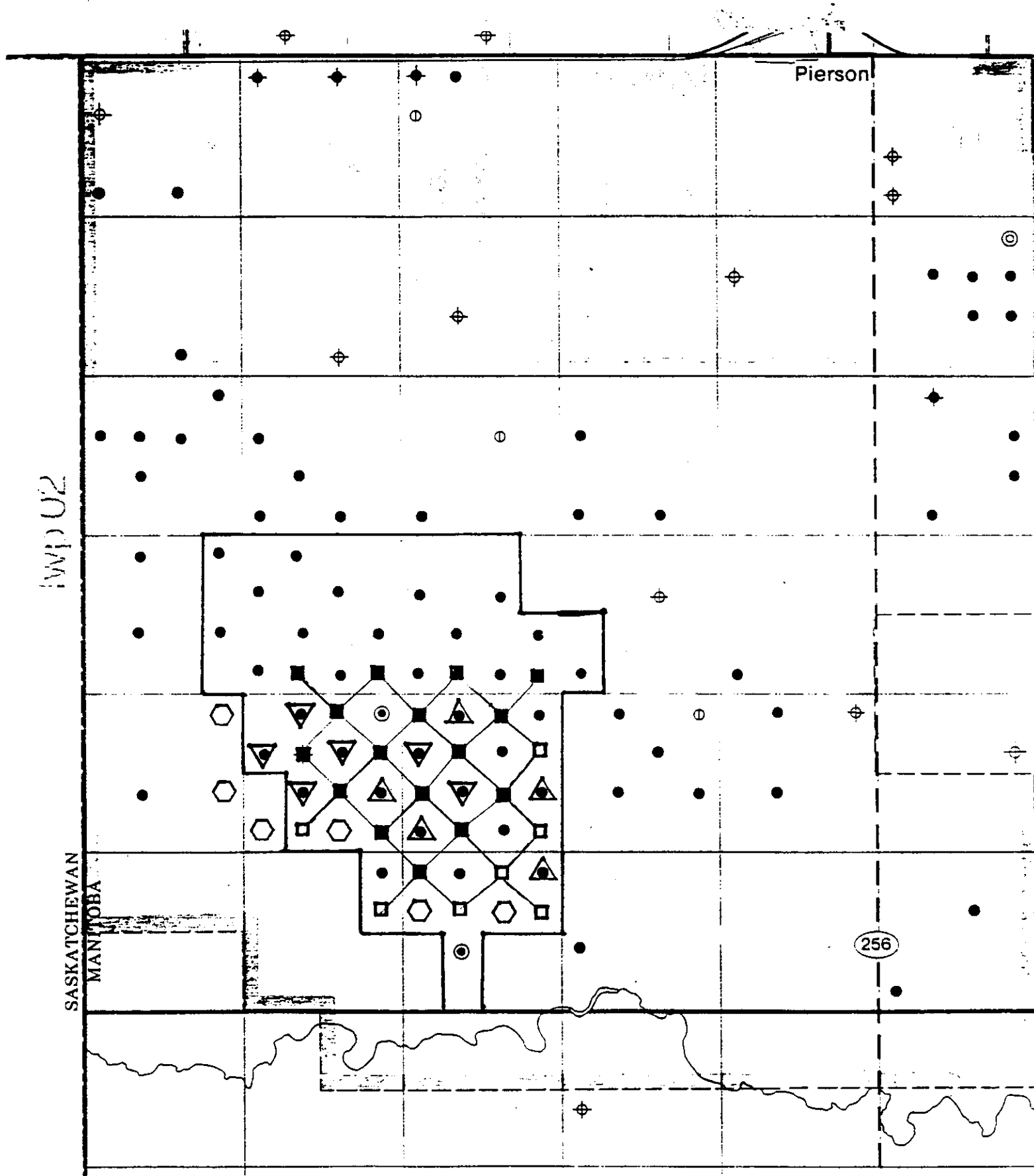
Pierson

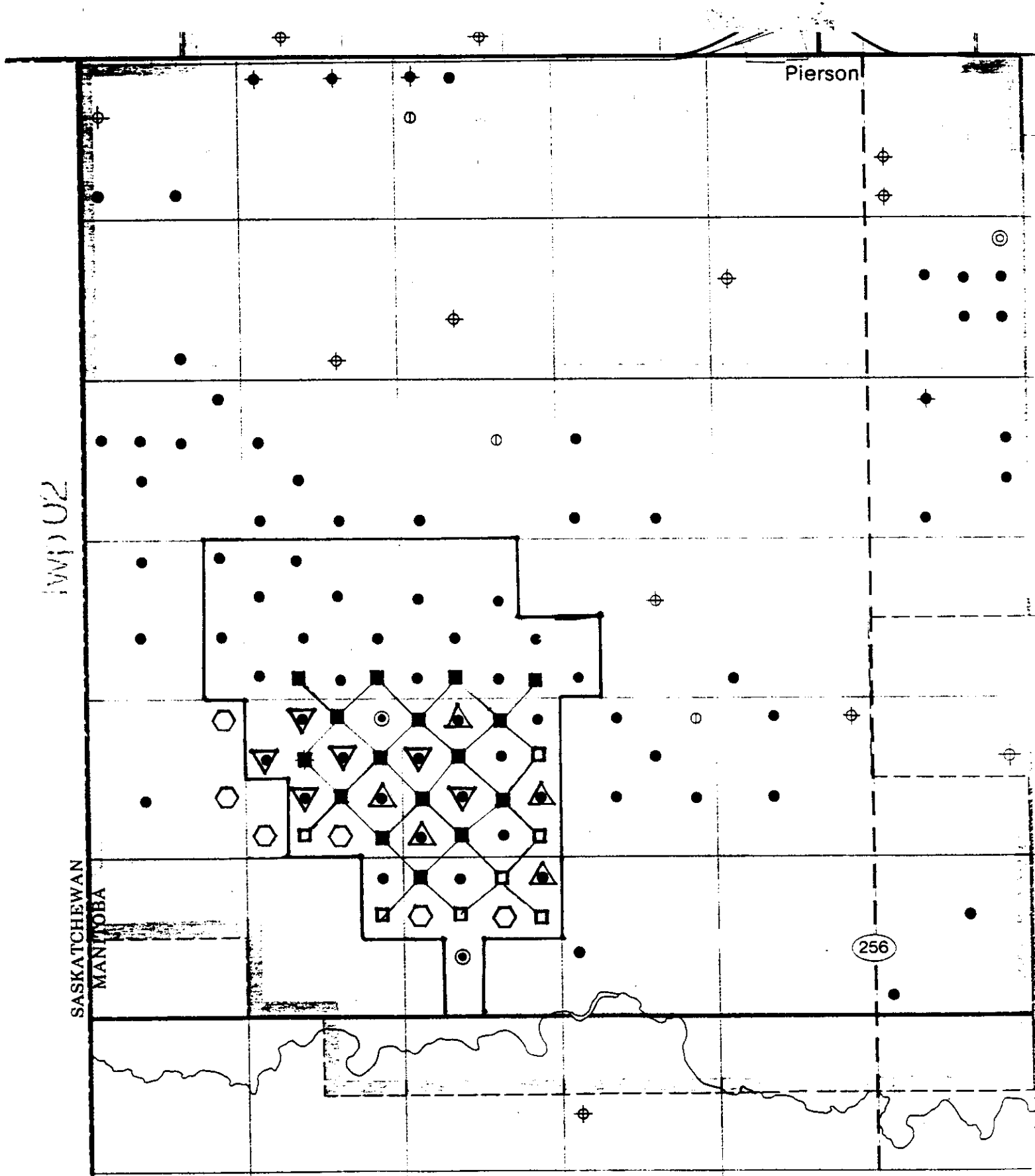
SASKATCHEWAN  
MANITOBA

256

- INFILL DRILLING FALL/93
- INFILL DRILLING WINTER/94
- 1993 32 ha LOCATIONS

- ▲ CONVERSIONS FALL/93
- ▼ CONVERSIONS WINTER/94





WPD 02

Pierson

SASKATCHEWAN  
MANITOBA

256

- INFILL DRILLING FALL/93
- INFILL DRILLING WINTER/94
- 1993 32 hr LOCATIONS

- △ CONVERSIONS FALL/93
- ▽ CONVERSIONS WINTER/94

April 2, 1992

The Oil and Natural Gas  
Conservation Board

- Ian Haugh, Chairman
- H. Clare Moster, Deputy Chairman
- Wm. McDonald, Member

John N. Fox  
Chief Petroleum Engineer  
Petroleum Branch

**RE: Home Oil Company Limited  
Applications for 32 ha Spacing and MPPR Increase  
Pierson Area**

The Branch has been waiting for Home to complete its Pierson area Lower Amaranth depletion and waterflood feasibility study (originally scheduled to be completed in December, 1991), before making recommendations on the applications. Home presented results of the study to Branch staff on February 20, 1992.

#### RECOMMENDATIONS

It is recommended that the Board request that Home supply additional technical information in support of its request for continuation of 32 ha spacing in the Pierson area.

It is also recommended that the Board advise Home that it questions the need for continuation of an increased MPPR in the Pierson area and ask Home to comment on the need for increased MPPRs.

A copy of the proposed Board deficiency letter is attached.

#### DISCUSSION

##### Pierson Area 32 ha Spacing - Home Oil

Home has applied for permanent establishment of 32 ha spacing in the Pierson area (September 1991). The company has also requested that 32 ha spacing be extended to include the Mission Canyon Formation.

Notice of the application was issued in the Manitoba Gazette (October 19, 1991), The Deloraine Times and Star (October 23, 1991) and The Melita New Era (October 22, 1991). In addition, the notice was forwarded to all lessors and lessees in and within one kilometre of the area of application (Figure 1). In the notice of the application, the Board extended temporary approval of 32 ha spacing (originally scheduled to expire

October 31, 1991), until a decision on the application is made.

Home has conducted a reservoir simulation model study of the Lower Amaranth. When the Lower Amaranth was modelled as a volumetric reservoir, the model predicted a much more rapid decline in reservoir pressure and production than actually experienced. Home attributes the slower than predicted decline in reservoir pressure and production to additional pressure support as a result of water influx from the underlying Mission Canyon through natural and induced fractures.

The Pierson Lower Amaranth C Pool has a estimated average reservoir pressure of 8000-9000 kPa (based on pressure data from late 1990), well above the bubble point pressure of 4600 kPa. The low production decline rate (about 7% /year - Figure 2) and GOR of  $64.8 \text{ m}^3/\text{m}^3$  (4th Qu/91) confirms that the reservoir is still above the bubble point. Home estimates that with the current mode of depletion, the bubble point will not be reached for another 2 - 3 years.

For the purpose of its study, Home established a "project area" and a "waterflood area". These areas are shown in Figure 3. Home estimates original oil-in-place (OOIP) in the **project area** of  $4.4 \times 10^6 \text{ m}^3$  and primary recoverable reserves on 32 ha spacing of  $535.6 \times 10^3 \text{ m}^3$  (12% OOIP). Home's waterflood feasibility study indicated pressure maintenance in the **waterflood area** would increase the ultimate recovery to 30-40% OOIP. Home indicated the most feasible waterflood configuration would probably be an inverted 5-spot injection pattern on 16 ha spacing as shown in Figure 4. Home is also considering a number of options including horizontal drilling. Home's primary and secondary production forecasts for the **waterflood area** are shown on Figure 5. Home indicated it is preparing a pressure maintenance application for submission in May 1992. Because a proposed pressure maintenance project may involve drilling of wells on 16 ha spacing, it is recommended that final disposition of the spacing application be delayed until the Board receives and completes its review of Home's pressure maintenance application.

Though it appears prudent to allow 32 ha spacing to continue under primary production to avoid accelerating pressure depletion. There remain a number of technical questions to be addressed.

The Branch has used productivity (daily oil and cumulative production) to separate the area of application into areas of high and low recovery (Figure 6). The Branch is of the opinion that 32 ha spacing under primary production may be warranted in the areas with better reservoir quality and high recovery but questions the applicability of 32 ha spacing on the edges of the pool.

Home's commitment to developing the lands on the edge of the pool is questionable. Since July 1990 Home has released 5 quarter sections within the boundaries of Board Order No. SU6. In addition in 1992 the company is facing Crown and freehold lease expires on another 3 1/2 sections within or adjacent to the area of application (Figure 3). It is recommended that Home be asked to address the applicability of 32 ha spacing for the lands highlighted in Figure 6.

In the Board's letter of approval accompanying Board Order No. SU5 (October 1989), Home was asked to review the economics of developing the Lower Amaranth on 16 ha spacing, paying particular attention to determination of the level of incremental recovery associated with reduced spacing. This information has not been filed with the application.

Home's only rationale for extending 32 ha spacing to include the Mission Canyon is that the two formations are in communication. Home has recompleted all its Mission Canyon producers to the Lower Amaranth and has not provided any information on its development or depletion strategy for the Mission Canyon.

It is recommended that the Board send Home a deficiency letter asking the company to address these questions.

#### Pierson Area - MPPR Restrictions

Coincident with submission of its application to establish 32 ha spacing on a permanent basis, Home applied for continuation of an MPPR of 14 m<sup>3</sup> /day and 360 m<sup>3</sup> /month for the Lower Amaranth and extension of the increased MPPR to wells producing from the Mission Canyon. Board Order No. 80A approving a temporary increase in MPPR for wells producing from the Lower Amaranth (originally scheduled to expire October 31, 1991), was extended by the Board in the notice of Home's application.

During the 4th/Qu 1991, only the 16-9-2-29 well (242 m<sup>3</sup>, October 1991) produced more than the original MPPR of 9.5 m<sup>3</sup> /day and 240 m<sup>3</sup> /month (Figure 7). None of the 10 wells drilled or recompleted by Home in 1991 are capable of producing 240 m<sup>3</sup> /month. In addition, at year end Home did not have any wells producing from the Mission Canyon.

It is recommended that the Board advise Home that it questions the need for continuation of increased MPPR's in the Pierson area and requests that Home comment on the need for increased MPPR's. The company should also be advised that if a pressure maintenance scheme is implemented, MPPR restrictions would, upon application and provided no equity or conservation concerns exist, be waived.

It is recommended that final disposition of this application be delayed until the Board receives and completes its review of Home's pressure maintenance application.

*John N. Fox*  
John N. Fox

Approved: \_\_\_\_\_  
L.R. Dubreuil, Director

FIGURE NO. 1

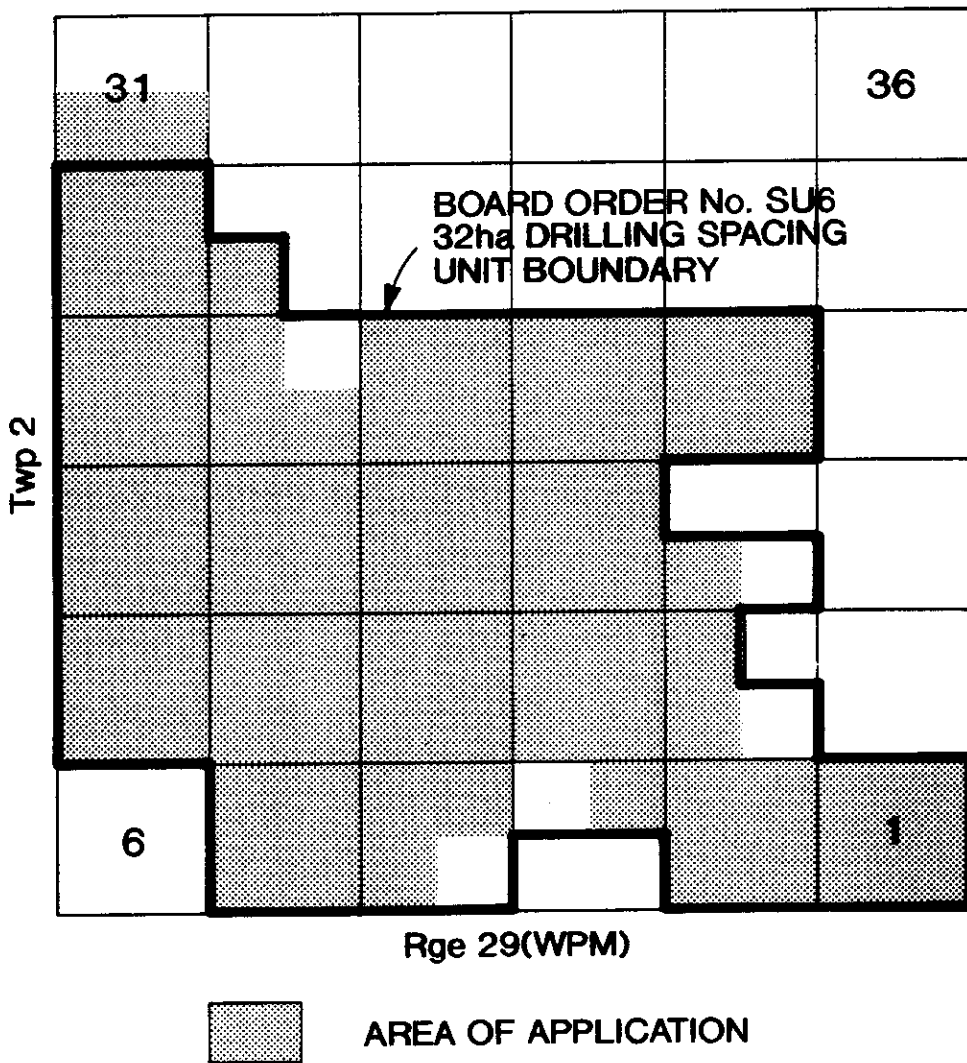




FIGURE NO. 2

PIERSON LOWER AMARANTH C POOL

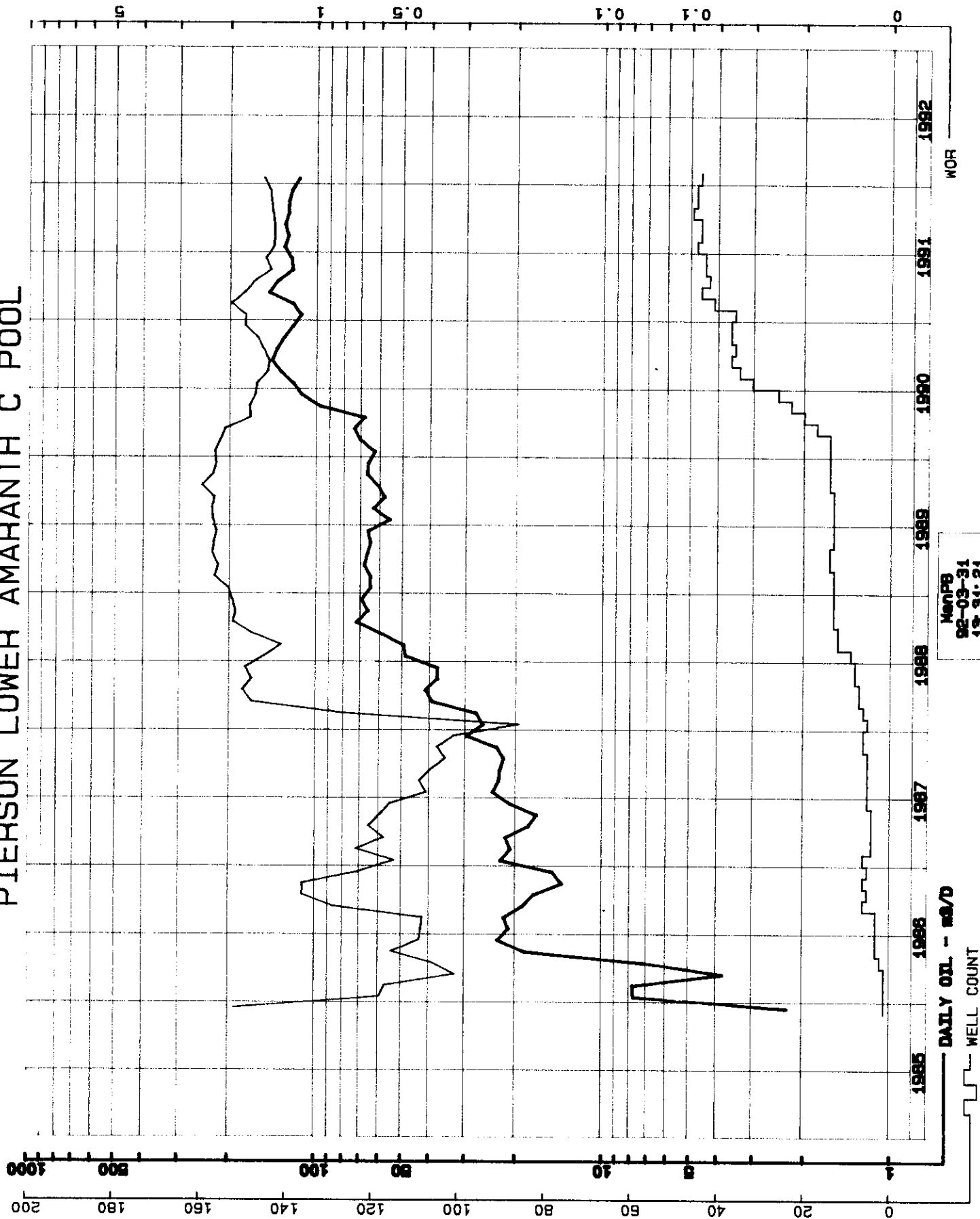
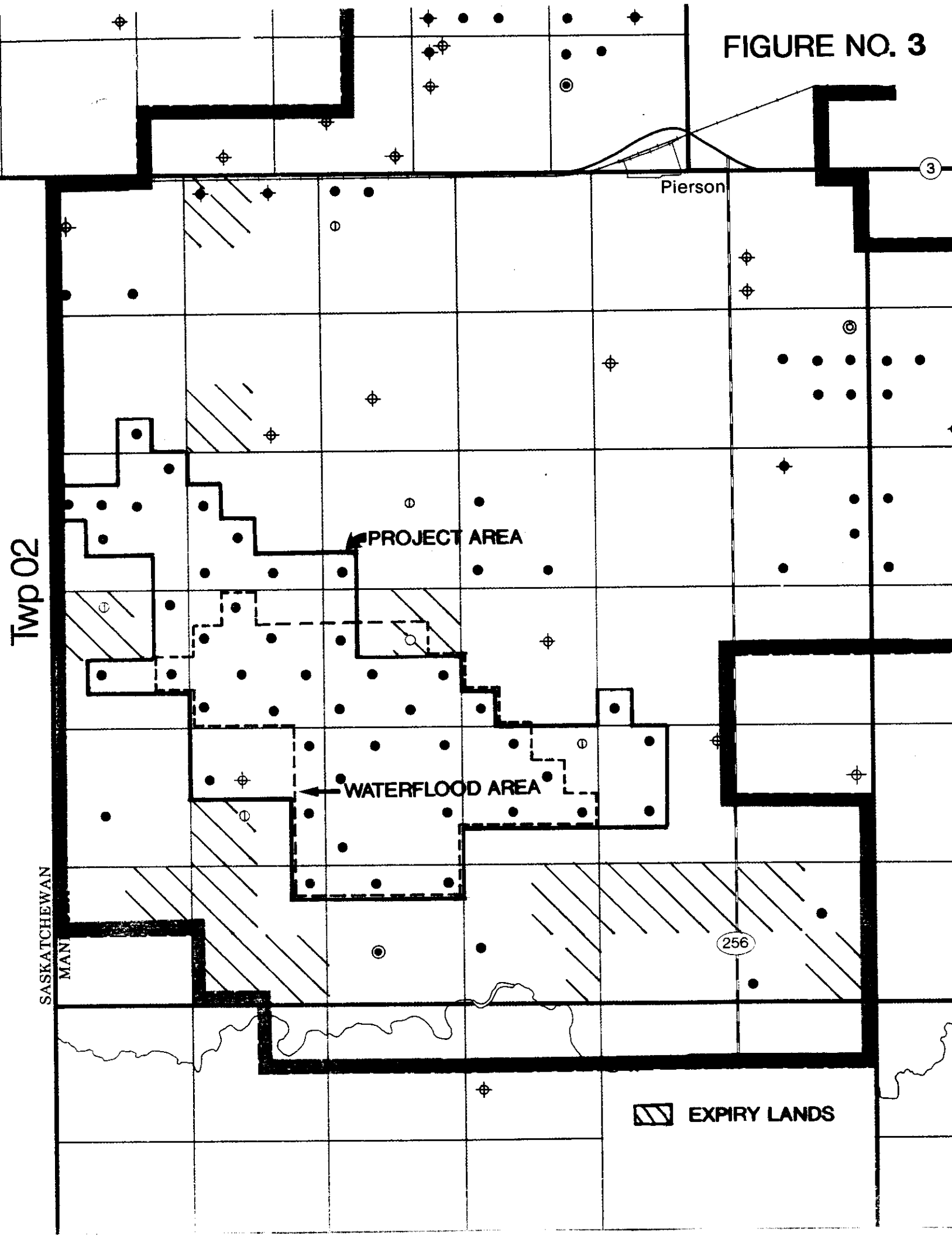
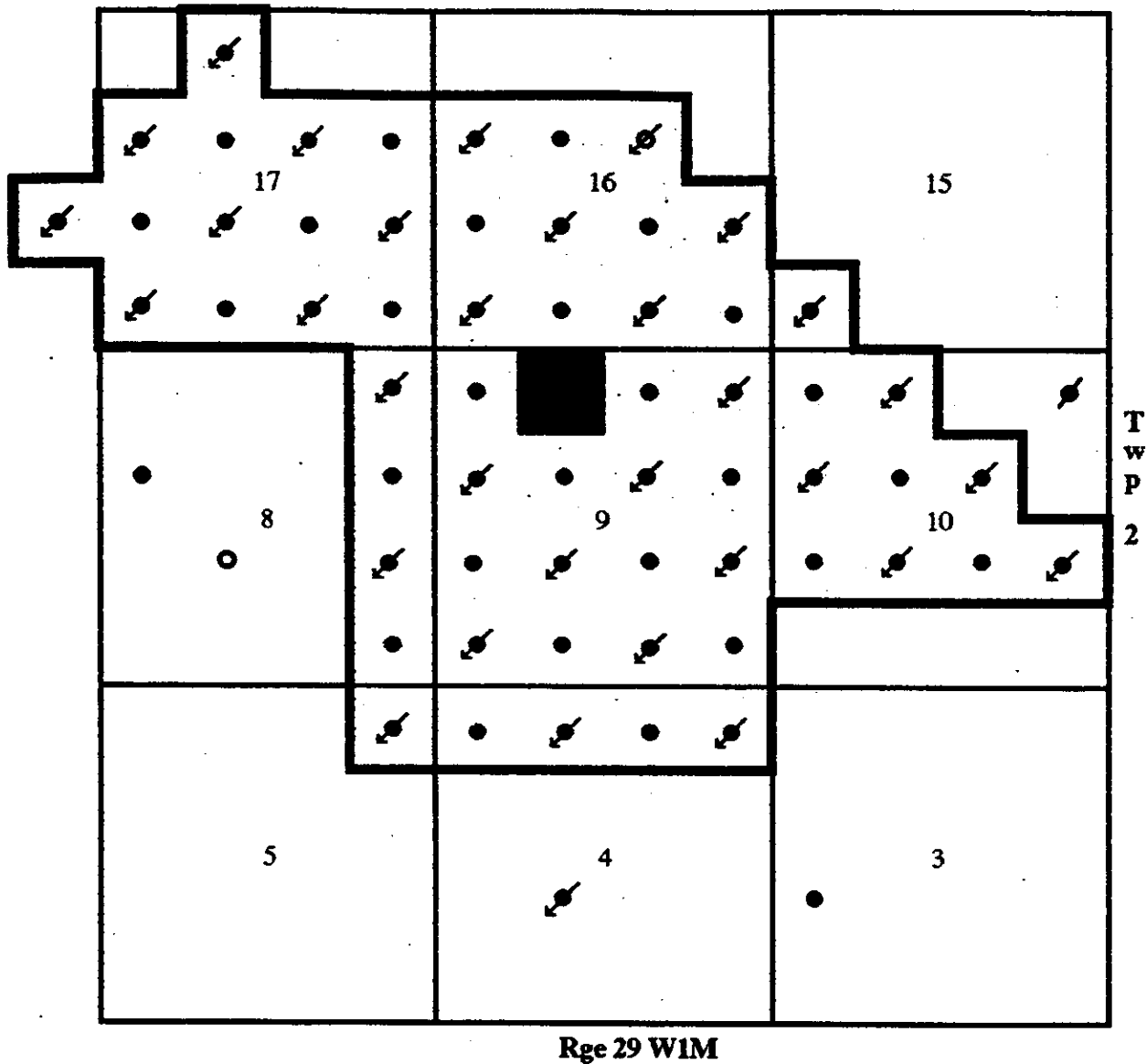


FIGURE NO. 3



**SOUTH PIERSON WATERFLOOD AREA**



 Proposed Waterflood Area

 Central Facilities

 Current Producing Wells converted to Injectors

 Infill Drilling Locations

 1992 Drilling Locations

# **SOUTH PIERSON PRODUCTION FORECAST OF WATERFLOOD AREA**

**FIGURE NO. 5**

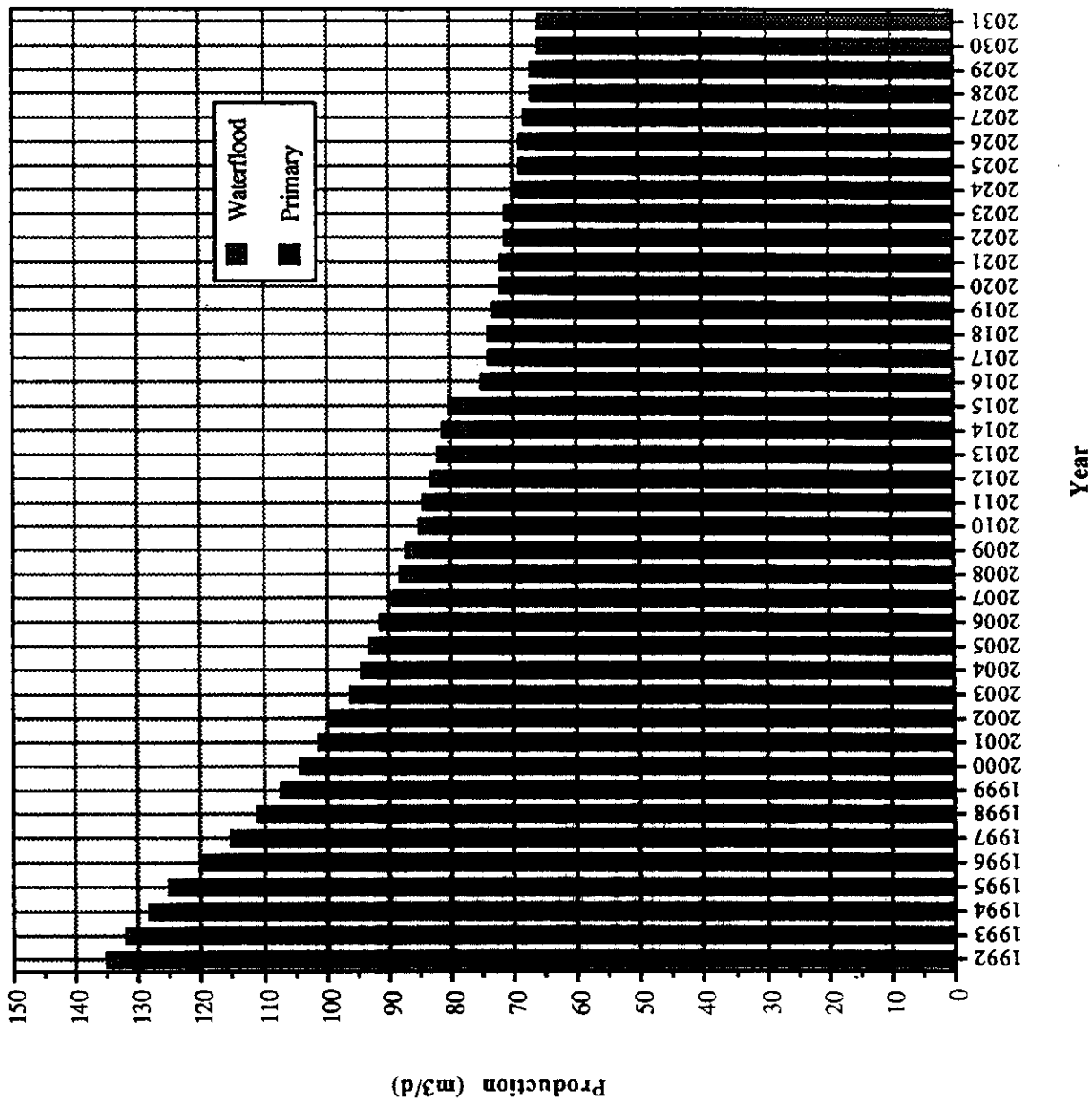
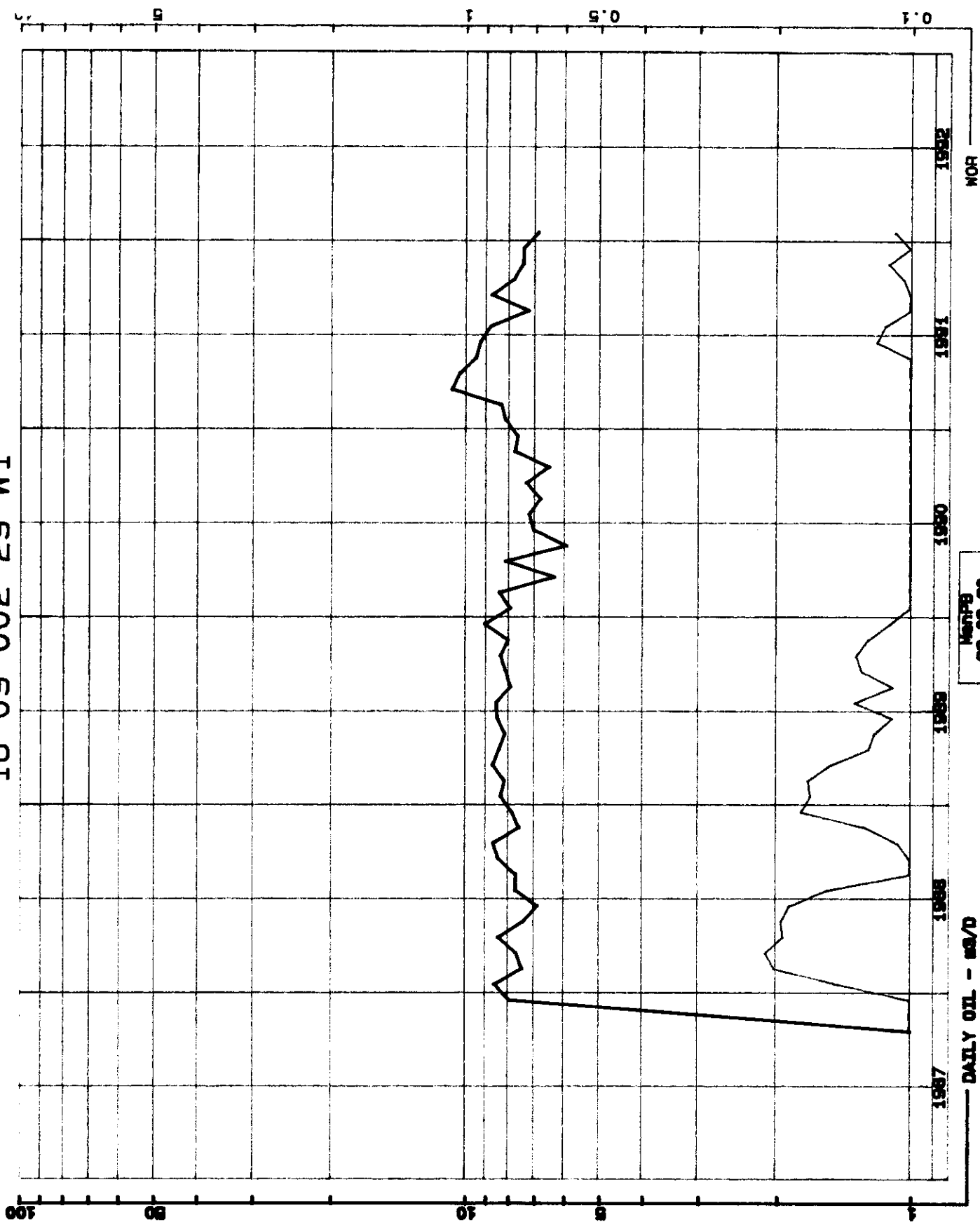




FIGURE NO. 7

16-09-002-29 W1



MDP  
92-03-30  
11:04:13

DAILY OIL - mb/d

WOR

### 32 ha Spacing

IMPROVE RECOVERY  
FACTORS

1.1.1.1

2.1.1.1

3.1.1.1

- ① DEVELOPMENT PLANS WITHIN 32 ha SPACING  
64 UNDRILLED S.W.

- ② 32 ha SPACING RECOVERY - APPLICATION 10-12% RECOVERY, REVIEW  
OF WELL PERFORMANCE INDICATES WELLS ALONG EDGES OF POOL  
POOR PERFORMERS - IS <sup>RECOVERY OF</sup> 10-12% OOIIP OVERALL AVERAGE WITH  
WELLS IN BETTER PORTION OF POOL RECOVERING >12% OOIIP  
AND WELLS IN POOREST PORTION OF THE POOL RECOVERING  
<10% OOIIP

- see a  $\phi$ h map, ultimate recovery map  
and a <sup>ULTIMATE</sup> RECOVERY FACTOR (% OOIIP) MAP

- OBJECTIVE HERE IS TO DETERMINE IF ALL OF  
APPLICATION AREA SHOULD CONTINUE ON 32 ha SPACING

- ③ ONE THING MISSING FROM AGRIN DISCUSSION OF INCREMENTAL  
RECOVERY ON 16 HA VS 32 HA SPACING - HOC'S PREVIOUS POSITION  
NO INCREMENTAL RECOVERY FOR 16 HA DEVELOPMENT

- ④ ECONOMICS - PREVIOUS AGRIN CAPITAL COSTS - \$320M <sup>DRILL, COMPLETE  
EQUIP, TIE-IN</sup>  
- UNDERSTAND FROM LAST MEETING (FAC) - COST DOWN  
TO \$250M  
- NOTED WORSE INITIAL PERFORMANCE OF  
(91 WELLS DRILLED IN 1991) - 3.1 m<sup>3</sup>/c

⑤ NC SPRING - 11 NC Pools in PIERSON FIELD AL-  
DEVELOPED ON 16 HA SPRING - POOL  
SIZE REQUIRED FLEXIBILITY TO DEAL  
ON 16 HA TARGETS - CONCERNED  
NC EFFECTS - NON-ISSUE



nt. - limit well draw rate to minimize depletion

16-9-2.29 ONLY WELL CAPABLE OF PRODUCING NEAR DPR = 240 L<sup>3</sup>/L<sub>in</sub>

PRODUCED OVER DPR 8 MONTHS IN 1991

AVERAGE 1991 MONTHLY PRODUCTION

1ST 6 MONS - 283.9 L<sup>3</sup>/mon

2ND 6 MONS - 245.0 m<sup>3</sup>/mon

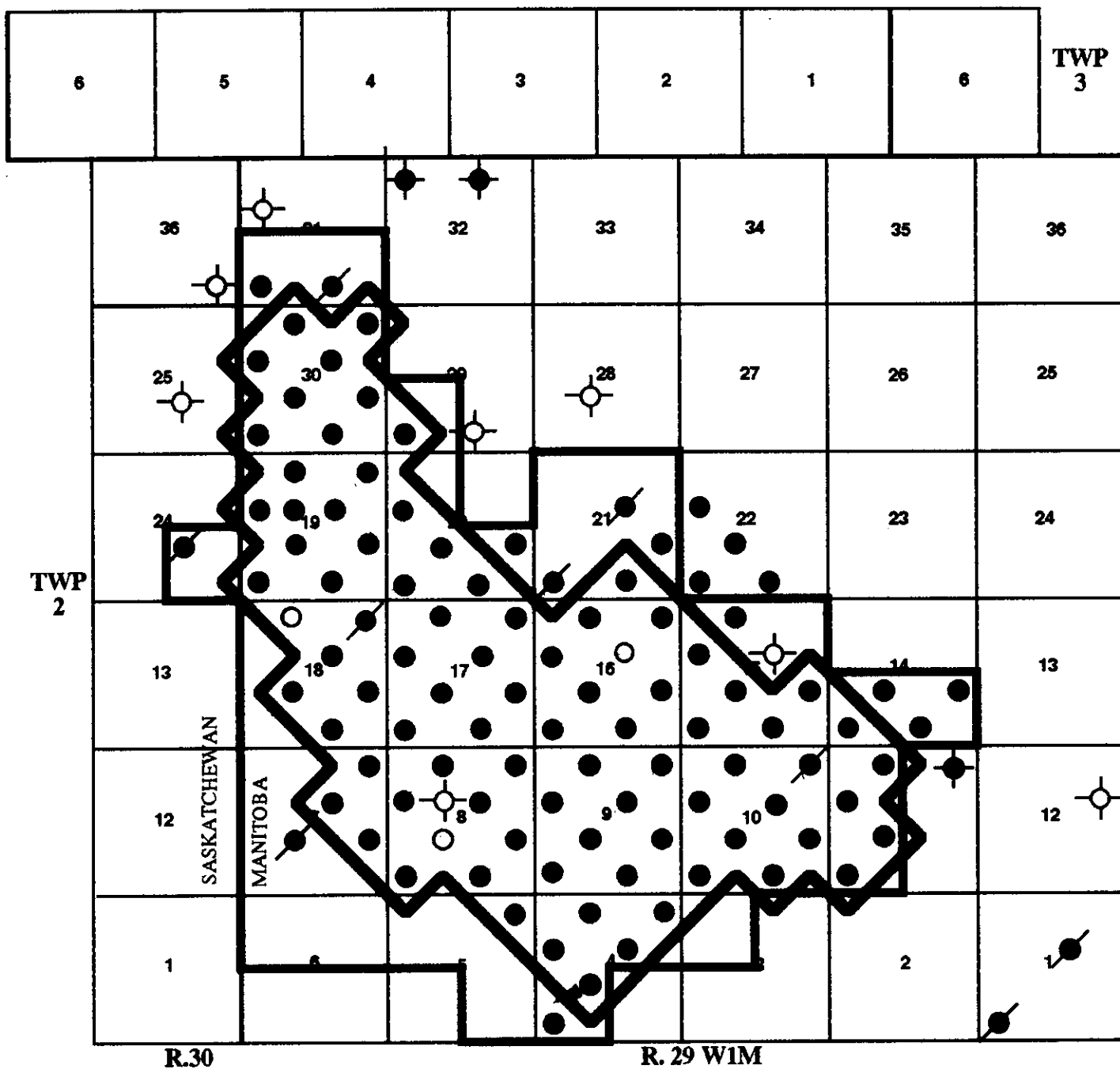
IP WAS OBTAINED 91 - 2.3 m<sup>3</sup>/d

- INCREMENTAL RECOVERY 16 ha VS. 32 ha.

32 ha recovery 10-12% OOI<sub>P</sub> - overall average on range from >12% in better portions of pool to <10% in poorer portions

Figure 1.0

# SOUTH PIERSON AREA

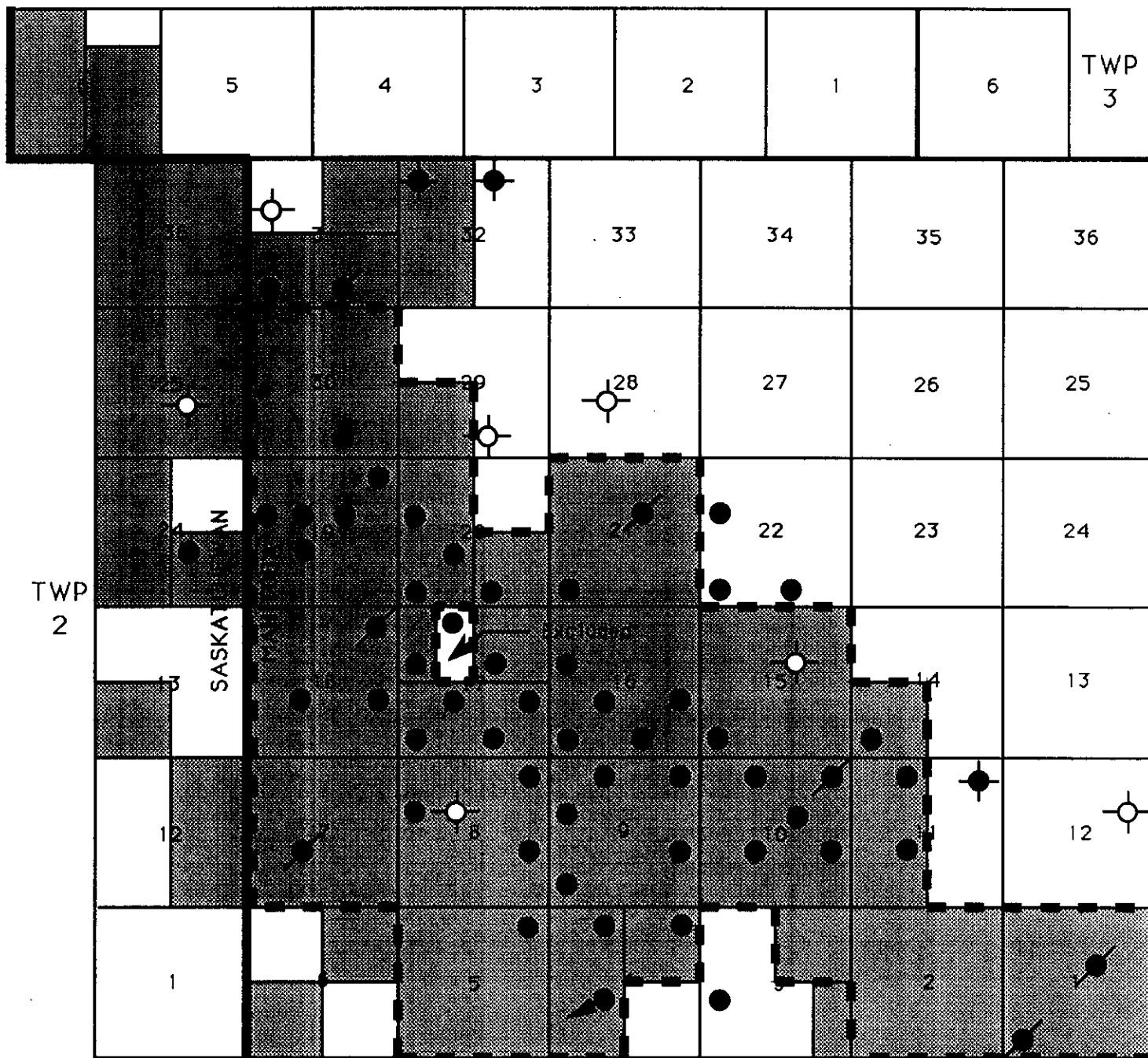


— Project Area  
 — Waterflood Area

● CURRENT WELLS  
 ○ 1992 WELLS  
 ● POTENTIAL 32 HA. INFILLS

● H2O DISP. WELL

ATTACHMENT 1  
SOUTH PIERSON AREA



R.30

R. 29 W1M



HOC / SRO LANDS



32 ha DRILLING SPACING UNITS

April 10, 1992

Mr. Jan Olthof, P. Eng.  
Manager, Southern Production  
Home Oil Company Limited  
1600 Home Oil Tower  
324 - 8th Avenue S.W.  
Calgary, Alberta  
T2P 2Z5

Dear Mr. Olthof:

RE: Pierson Area  
Applications for Special Drilling Spacing Units and  
Increase in Maximum Permissible Production Rate Restrictions

The Board has reviewed the information filed by Home Oil in support of the subject applications including the material presented to the Petroleum Branch at the February 20, 1992 meeting. The Board requests that Home provide comments in respect of the following aspects of the applications:

#### AREA OF APPLICATION

Home has drilled 55 wells in the area of application over the last seven years. There remain 82 undrilled 32 ha spacing units. Over the last year Home has released five (5) quarter sections within the boundaries of Board Order No. SU6. In addition in 1992, Home is facing Crown and freehold lease expiries on another 3 1/2 sections within the area of application.

A review of individual well daily and cumulative oil production indicates that wells within the better portions of the reservoir are probably capable of effectively draining more than 16 ha, while wells near the edges of the reservoir are not. In order to determine the appropriateness of 32 ha spacing for all lands within the area of application, the Board requests that Home submit the following:

- (a) A  $\phi$ h or hydrocarbon pore volume map for the area of application;

- (b) Current and ultimate primary recovery estimates for all wells within the area of application. This information can be presented on a table or map; and
- (c) Home's plans to develop undrilled 32 ha spacing units within the area of application.

How would denial of 32 ha spacing on the lands highlighted on Figure 1 impact Home's development plans for the Pierson Area?

#### 16 HA SPACING - INCREMENTAL RECOVERY

In the Board's letter of approval accompanying Board Order No. SU5 (October 1989), Home was asked to review the economics of developing the Lower Amaranth on 16 ha spacing, paying particular attention to determination of the level of incremental recovery associated with reduced spacing. This information has not been filed with the application.

A review of previously filed economics indicate the feasibility of 16 ha spacing is dependent on the level of incremental recovery, oil prices and capital cost. Please provide the Board with updated reduced 16 ha spacing drilling economics including Home's estimate of incremental recovery on 16 ha spacing.

#### MISSION CANYON DEPLETION STRATEGY

Home presently does not operate any wells completed in the Mission Canyon Formation in the Pierson Field. Other operators in the Pierson Field are commingling Lower Amaranth and Mission Canyon production. What is Home Oil's strategy for recovering Mission Canyon reserves? Please comment on the economics of stand alone Mission Canyon development drilling.

There are presently eleven (11) Mission Canyon pools in the Pierson Field, all developed on 16 ha spacing. The small size of the pools and geological variability of the Mission Canyon appears to lend itself to development on 16 ha spacing. Please comment on this statement.

#### MAXIMUM PERMISSIBLE PRODUCTION RATE (MPPR) RESTRICTIONS

The Board has reviewed production in the area of application. In the 4th quarter of 1991, no wells produced significantly more than the MPPR of  $9.5 \text{ m}^3/\text{d}$  and  $240 \text{ m}^3/\text{month}$  set out in Schedule D of the regulations.

The Board questions the need for continuation of an MPPR of  $14 \text{ m}^3/\text{d}$  and  $360 \text{ m}^3/\text{month}$  as approved under Board Order No. 80A during continued primary depletion of the Lower Amaranth. If a pressure maintenance scheme is implemented in the Lower Amaranth, MPPR restrictions would, upon application and in the absence of equity or conservation concerns, be waived for the waterflood area.

The Board requests Home comment on the need for continuation of increased MPPR's in the Pierson area.

OTHER MATTERS

- (a) What is the status of discussions with Mr. Southam regarding the concerns he raises in his objection to continuation of 32 ha spacing (refer to Board's letter of December 19, 1991)?
- (b) Home indicated the current reservoir pressure in the Pierson Lower Amaranth C Pool is approximately 9000 kPa. The last pressure data the Board has on file is from late-1990. Please provide a copy of the results of any pressure surveys taken in 1991 and Home's pressure survey plans for 1992.

The Board does not intend to complete disposition of the subject applications until it receives and completes its review of the pressure maintenance application Home has indicated it will be submitting in May 1992. If you have any questions in respect of this matter please contact L.R. Dubreuil, Director of Petroleum, or John N. Fox, Chief Petroleum Engineer, at (204) 945-6573 or 6574, respectively.

Yours respectfully,

ORIGINAL SIGNED BY  
H. CLARE MOSTER

H. Clare Moster  
Deputy Chairman

FIGURE NO. 1

Twp 02

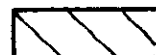
SASKATCHEWAN  
MAN

Pierson

AREA OF APPLICATION

TUNDRA OIL & GAS LTD.

256



LANDS CONSIDERED FOR EXCLUSION  
FROM 32 ha SPACING APPROVAL

HOME - PETROLEUM MEETING

**FEBRUARY 20, 1992**

## PIERSON AREA

## Geology

O/W contact @ 555 m subsea - long transition zone - economic production perhaps below this level.

- $\phi_D$  cut-off = 12%
- migration pathway through MC directly within the Pierson Field - different stratigraphic units in MC, some oil-bearing, some not.
- 14-9-2-29 underlying MC oil potential, not completed.
- PLAYA LAKE ENVIRONMENT - J. Murray's interpretation.

### Area Update

- 136 m<sup>3</sup> OPD )
- 180 m<sup>3</sup> WPD ) average since May 1991
- freehold expiries outside of fairway - (10) 1/4 sections at or when o/w contact
- Daily oil vs cumulative production plot --> 6.5 - 7% /year decline.

ROIP - 535,000 m<sup>3</sup> decline curve and M.B. analysis fairly close.

- uneconomic to pipeline gas to Waskada Gas Plant  
500 - 750 MMCFD, GOR - 150-180 scf/bbl

1991

- drilling cost - \$150 M
- completion cost - \$65 M
- equipment and tie-in - \$35 to \$50 M
  
- lifting cost - \$4.00 /bbl
- net oil income - \$12 /bbl
  
- effective March 1, 1992 - Esso not purchasing crude from Home, company reviewing trucking production south into North Dakota



## Waterflood Study

- project area --> fairway
- waterflood area - further refinement of fairway, parts of E/2 - 8, 9, 10, 16, and 17

### Reservoir Properties:

K = 2-4 md  
Ø average = 15%  
h average = 3.5 m  
SW average = 45%  
oil = 1.3 cp (36° API)  
water = 0.8 cp

Bubble point pressure - 4600 kPa  
Reservoir strongly water-wet

Project area OOIP -  $4.4 \times 10^6 \text{ m}^3$   
Project area ROIP -  $535.6 \times 10^3 \text{ m}^3$  decline curve analysis  
and material balance

Primary Recovery Factor = 12% (contribution from MC - pressure support/water influx)

$S_{wirr} = 41\%$   
 $S_{or} = 69\%$

Waterflood areal sweep efficiency --> 80% range 82-86% for inverted 5-9 spot injection pattern

- pattern selection factors - injectivity vs. cost
- predicted waterflood recovery 30-40%
- minimal recovery after breakthrough
- 40 acre spacing selected as most feasible (lower spacing would accelerate recovery but is not economic)
- project life 35-40 years due to low injectivity volumes
- if no pressure maintenance, bubble point will be reached in 2-3 more years and when reached will have a severe impact on oil production
- considering horizontal drilling - estimated initial productivity 15-20  $\text{m}^3/\text{d}$ , produce wells for 1-2 years, to recover flush production then convert to injection, would allow for increased injection, one horizontal well would replace 2 vertical wells
- 5 spot injection patterns, convert producers to injection, drill 16 ha infill producers
- \$12-14 MM drilling/completion/equipment for waterflood and \$2MM upgrade facilities - Economics are marginal

- subtle request for EOR incentive. Note, present incentive program works against drilling WIW wells, i.e. holiday volume cannot be used.
- May 1 submission of waterflood report (pilot project)
- More extensive pressure surveys planned for 1992



## Action / Route Slip

Date: January 6, 1992

To: L.R. DUBREUIL

From: H. CLARE MOSTER

Telephone:

☐ Take Action

☐ Per Your Request

☐ Circulate, Initial  
and Return

☐ For Approval and  
Signature

☐ Make \_\_\_\_\_ Copies

☐ May We Discuss

☐ For Your Information

☐ Return With Comments  
or Revisions

☐ Draft Reply for  
Signature

☐ Please File

Comments: RE: SPELLISCY LETTER - PIERSON AREA APPLICATIONS:

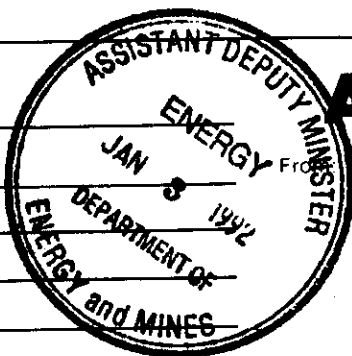
Please draft an appropriate response for my signature addressing both the apparent after the fact notice and the availability of the application.

Do we need to change current Notice procedures to alleviate recent concerns from parties (i.e: Southam, Spelliscy)?

Attachment



Date: *Jan. 2/92*  
 To: *Clare Master*



## Action / Route Slip

Office of the Deputy Minister  
 Manitoba Energy and Mines  
 Room 309  
 Legislative Building  
 Winnipeg, Manitoba  
 R3C 0V8

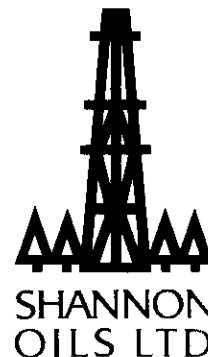
- |                                         |                                               |                                                            |                                                     |                                            |
|-----------------------------------------|-----------------------------------------------|------------------------------------------------------------|-----------------------------------------------------|--------------------------------------------|
| <input type="checkbox"/> Take Action    | <input type="checkbox"/> Per Your Request     | <input type="checkbox"/> Circulate, Initial and Return     | <input type="checkbox"/> For Approval and Signature | <input type="checkbox"/> Make _____ Copies |
| <input type="checkbox"/> May We Discuss | <input type="checkbox"/> For Your Information | <input type="checkbox"/> Return With Comments or Revisions | <input type="checkbox"/> Draft Reply for Signature  | <input type="checkbox"/> Please File       |

Comments:

*Please reply direct.*

*Is there a problem with our procedures?*

*Jan Daugh/R.*



B O X 1 1 1 1  
R E G I N A  
S A S K A T C H E W A N  
S 4 P 3 R 2  
(306) 543 1416  
F A X 949 8805

December 28, 1991

Manitoba Petroleum Branch  
The Oil and Natural Gas  
Conservation Board  
Room 309  
Legislative Building  
Winnipeg, Manitoba  
R3C 0V8

Attention: Mr. H. Clare Moster

RE: Applications for Special Spacing Units and  
Increased Maximum Permissible Production Rate  
Restrictions - Pierson Area

With reference to the recent applications by Home Oil Company and Tundra Oil and Gas Ltd. in respect to special spacing units and increased maximum permissible production rate restrictions.

Please be advised that Shannon Oils Ltd. is not necessarily in favour or against above captioned applications. We would however like more lead time for such things. Please note that we had only been advised of this application November 21, 1991, 9 days after the time arbitrarily set by the board to hear any objections to the Home and Tundra proposals.

As well, if it is possible I would like to receive a copy of the application since it does affect our Manitoba land base.

Thanking you, I remain,

Yours very truly,

SHANNON OILS LTD.

  
Shaun Spellmisky



December 19, 1991

Mr. Jan Olthof, P. Eng.  
Manager, Southern Production  
Home Oil Company Limited  
1600 Home Oil Tower  
324 - 8th Avenue S.W.  
Calgary, Alberta  
T2P 2Z5

Dear Mr. Olthof:

**RE: Application for 32 ha Spacing Units  
Pierson Area**

The Board has received an objection to the subject application from Doug Southam, the mineral owner in the S/2 of Section 17-2-29 (WPM). A copy of the letter of objection is attached.

Mr. Southam is concerned that 32 ha well spacing in the area of application will result in lower ultimate recovery than 16 ha spacing. The Board requests Home Oil contact Mr. Southam to discuss his concerns. It is also suggested that after the discussions, Home ask Mr. Southam to inform the Board whether or not he is prepared to withdraw his objection.

If you have any questions in respect of this matter, please contact L.R. Dubreuil, Director of Petroleum, or John N. Fox, Chief Petroleum Engineer at (204) 945-6573 and 945-6574, respectively.

Yours respectfully,

**ORIGINAL SIGNED BY  
H. CLARE MOSTER**

H. Clare Moster  
Deputy Chairman



Box 243,  
Wadena, Manitoba  
R0M 1L0  
November 11, 1991.

Mr. H. Clare Moser,  
Deputy Chairman,  
Mines and Mineral Board,  
Room 309, Legislative Building,  
Winnipeg, Manitoba  
R3V 0V8

Dear Sirs,

I am writing to register my objection to Board Order No. 506 (to establish 32 hectare drilling spacing units for the Lower Amarant in the South Peerson field) being made permanent. As a mineral owner I am not convinced that the total recovery from the Lower Amarant in this field will be as good from 32 hectare drill spacings as it would be from 16 hectare spacings.

I can appreciate the economics of the present situation as far as Home Oil Company is concerned and do not think they should be required to carry out 16 hectare drill sites immediately. However, if they require extra time to make this field economically viable, I feel that they should present a long term plan which would see 16 hectare drill sites or horizontal drilling commencing in 1994 with completion in 1999. A plan such as this coupled with

supplementary flooding would yield the greatest quantity of oil recovered from this field and should also be an economic operation.

I am somewhat disturbed by the timeline in giving notice to mineral owners and other interested parties. The request by Home Oil Company was made on Sept 25th, 1991; the public notice dated in Winnipeg on October 10, 1991, did not appear in the *Winnipeg New Era* until October 22, 1991. When I called at the Washada office of the Petroleum Branch on October 23, 1991, to view a copy of the application it was not available. A staff member in the Winnipeg office of the Petroleum Branch told me over the phone on October 25, 1991, that this material had not been sent to the Washada office. Consequently, I was not able to view this application until November 7, 1991, and have not had sufficient time to study and gather information.

When the original application was made in 1989, all mineral owners in the designated area were notified by mail and given the opportunity to respond. In 1991 all mineral owners have not been notified and a very limited time given to those who read the public notice. Is there a good reason for the rush and the apparent lack of information?

Yours truly,  
Doug Southern



December 19, 1991

Mr. Doug Southam  
Box 243  
Melita, Manitoba  
R0M 1L0

Dear Mr. Southam:

**RE: Application for 32 ha Spacing Units  
Pierson Area**

Your objection to Home Oil Company Limited's application for continuation of 32 ha spacing units in the Pierson area is acknowledged.

Board Order No. SU 6 approved 32 ha spacing in the Pierson area on an interim basis ending October 31, 1991. Upon receipt of Home's application for continuation of 32 ha spacing, the Board decided to extend Board Order No. SU 6 pending disposition of the application. Home Oil's application was deficient in that it did not include a complete list of lessors and lessees in and within one kilometre of the area of application. Home was requested to provide this information but did not respond on a timely basis. However, in order to advise persons potentially affected by continuation of the approval, the Board expedited notice of the application. Notice of the application was published in the Manitoba Gazette on October 19, 1991 and in the Melita New Era and Deloraine Times and Star on October 22 and 23, 1991, respectively. Delays in the submission of the required lessor and lessee lists resulted in a delay in direct notification to potentially affected parties. Direct notices mailed November 7, 1991 provided an extension of the deadline for objections or interventions from November 12, 1991 to December 2, 1991.

With respect to a copy of the application not being in the Waskada Office of the Petroleum Branch, the Board apologizes for any inconvenience that this may have caused you. It appears Board staff forgot to send a copy of the application to Waskada. After your visit, a copy of the application was delivered to the Waskada Office on October 25, 1991.

The Board has not completed its review of the application. The Board will, in its review, be addressing the issues raised in your objection; recovery levels on 16 ha versus 32 ha spacing and the feasibility and timing of waterflooding. The Board has sent Home Oil a copy of your objection and asked the company to address the points you raised.

The Board will keep you informed regarding disposition of the application. If you have any further questions in respect of this matter, please contact the undersigned at (204) 945-1111.

Yours respectfully,

**ORIGINAL SIGNED BY  
H. CLARE MOSTER**

H. Clare Moster  
Deputy Chairman



Date: December 18, 1991

## Action / Route Slip

To: H. Clare Moster

From: John N. Fox

Deputy Chairman

Chief Petroleum Engineer

Re. Objection to Home's 32 ha Spacing

Telephone:

### Application

- |                                         |                                               |                                                            |                                                     |                                            |
|-----------------------------------------|-----------------------------------------------|------------------------------------------------------------|-----------------------------------------------------|--------------------------------------------|
| <input type="checkbox"/> Take Action    | <input type="checkbox"/> Per Your Request     | <input type="checkbox"/> Circulate, Initial and Return     | <input type="checkbox"/> For Approval and Signature | <input type="checkbox"/> Make _____ Copies |
| <input type="checkbox"/> May We Discuss | <input type="checkbox"/> For Your Information | <input type="checkbox"/> Return With Comments or Revisions | <input type="checkbox"/> Draft Reply for Signature  | <input type="checkbox"/> Please File       |

Comments: Attached is the proposed Branch response to the objection to the subject application by Mr. Doug Southam. Home Oil has also been requested to address Mr. Southam's concerns. I believe the answers to your questions are contained in the Branch letters.



Date November 15, 1991

## Memorandum

To L.R. Dubreuil  
Director  
Petroleum Branch

From H. Clare Moster  
Assistant Deputy Minister  
Energy Division

Subject Doug Southam Objection to  
Continuation of Order SU6

Telephone

The attached objection should be considered in your processing of the subject applications.

Mr. Southam raises a number of concerns/questions in his letter. Of particular interest to me are:

1. Why was it not recommended that the Notice be sent to working and royalty interest owners in the area of application, similar to when the initial application was processed, particularly when that application did indicate the concerns of certain interest owners?
2. Why was a copy of the application not available at the Waskada office as indicated in the Notice?
3. What is Mr. Southam's interest in the application area (I do not recall from time of original application)? Are his concerns only related to Home's interest?

Please continue with processing

*Clare*

H. Clare Moster  
HCM/ms

attachment

*John*

*Prepare a note  
to address Clare's  
comments & concerns*

*It seems that  
Southam has done a  
depletion study and Home  
need not bother.*

*B.P.*

LRDmemo



Box 243,  
Melita, Manitoba  
R0M 1L0  
November 11, 1991.

Mr. H. Clare Mosler,  
Deputy Chairman,  
Mines and Mineral Board,  
Room 309, Legislative Building,  
Winnipeg, Manitoba  
R3V 0V8

Dear Sirs,

I am writing to register my objection to Board Order No. SU6 (to establish 32 hectare drilling spacing units for the Lower Amaranth in the South Pierson field) being made permanent. As a mineral owner I am not convinced that the total recovery from the Lower Amaranth in this field will be as good from 32 hectare drill spacings as it would be from 16 hectare spacings.

I can appreciate the economics of the present situation as far as Home Oil Company is concerned and do not think they should be required to carry out 16 hectare drill sites immediately. However, if they require extra time to make this field economically viable, I feel that they should present a long term plan which would see 16 hectare drill sites or horizontal drilling commencing in 1994 with completion in 1999. A plan such as this coupled with

supplementary flooding would yield the greatest quantity of oil recovered from this field and should also be an economic operation.

I am somewhat disturbed by the timeline in giving notice to mineral owners and other interested parties. The request by Home Oil Company was made on Sept 25th, 1991; the public notice dated in Winnipeg on October 10, 1991, did not appear in the Melita New Era until October 22, 1991. When I called at the Waskada office of the Petroleum Branch on October 23, 1991, to view a copy of the application it was not available. A staff member in the Winnipeg office of the Petroleum Branch told me over the phone on October 25, 1991, that this material had not been sent to the Waskada office. Consequently, I was not able to view this application until November 7, 1991, and have not had sufficient time to study and gather information.

When the original application was made in 1989, all mineral owners in the designated area were notified by mail and given the opportunity to respond. In 1991 all mineral owners have not been notified and a very limited time given to those who read the public notice. Is there a good reason for the rush and the apparent lack of information?

Yours truly,  
Doug Southern

Box 245,  
Melita, Man.  
ROM 120

Attn  
Mr. H. Clare Master,  
Deputy Chairman

Manitoba Energy and Mines,  
Petroleum Board,

Room 309, Legislative Building,  
Winnipeg, Manitoba.

R3V 018





The Oil and Natural Gas  
Conservation Board

Room 309  
Legislative Building  
Winnipeg, Manitoba, CANADA  
R3C 0V8

(204) 945-3130

November 7, 1991

Paul Kielhorn and Harold Freberg  
Executors of Estate of Amanda Freberg  
29 Langley Street  
Regina, Saskatchewan  
S4S 3V5  
Dear Sir/Madam:

RE: Applications for Special Spacing Units and  
Increased Maximum Permissible Production Rate  
Restrictions - Pierson Area

Attached are notices of applications by Home Oil Company Limited and Tundra Oil and Gas Ltd. for continuation of special 32 hectare drilling spacing units in the Pierson area and by Home Oil Company Limited for continuation of increased maximum permissible production rate restrictions in the Pierson area.

Due to delays in the filing of names and addresses of lessors and lessees within 1.0 kilometre of the areas of application, the period for filing objections to and interventions in the applications has been extended to December 2, 1991.

Yours respectfully,

A handwritten signature in black ink, appearing to read "H. Clare Moster". The signature is fluid and cursive, with a long horizontal stroke extending to the right.

H. Clare Moster  
Deputy Chairman

Att'd.



**Home Oil Company Limited**

1600 Home Oil Tower  
324 Eighth Avenue S.W.  
Calgary, Alberta T2P 2Z5  
Telephone (403) 232-7100  
Fax (403) 232-7678



November 4, 1991

Province of Manitoba  
Department of Energy and Mines  
Petroleum Branch / Engineering and Inspection Section  
555 - 330 Graham Avenue  
WINNIPEG, MANITOBA  
R3C 4E3



**Attention: Mr. John N. Fox, Chief Petroleum Engineer.**

Dear Mr. Fox:

**Re: Home Oil / Scurry-Rainbow South Pierson Field  
Waterflood Development Evaluation**

As per our discussions, Home Oil/Scurry-Rainbow are currently evaluating waterflood potential for the subject field. Recent reservoir simulation studies have helped us to better understand the primary depletion mechanisms of this reservoir however, further technical work is required before serious consideration can be given to a secondary recovery scheme.

Home/Scurry has committed to the below noted work over the next two (2) months in order to establish a sound basis for waterflood implementation:

**A) Reservoir Engineering Review:**

A more in-depth evaluation of the current data is required to better understand the relationship between the Lower Amaranth and the underlying Mission Canyon formation. This will involve the following:

- 1) Conduct a rigorous analysis of all production decline trends and the quantity and chemistry of all produced fluids in the field.
- 2) Completely review all pressure transient data to establish productivity (Permeability-Thickness) for each well in the field.
- 3) Conduct a complete petrophysical review of all data in the field to generate well productivity (Permeability-Thickness).

**B) Waskada Waterflood Review:**

An update of waterflood performance in the Waskada field would greatly aid in the evaluation of a South Pierson waterflood.

**C) Waterflood Simulation Study:**

A complete evaluation of the technical parameters involved with waterflooding this field yielding the following information:

- 1) The optimum configuration for injection versus production needs.
- 2) Facility requirements in association with item 1 above.
- 3) Timing of secondary recovery implementation.
- 4) Expected recovery / sweep efficiency and optimum injection pressure.
- 5) Full cycle economics.

**D) Horizontal Drilling Potential:**


A brief assessment of the economic and technical merits associated with horizontal drilling in the field.

It is Home/Scurry's intention to complete the above noted work before the end of this year. In a cooperative spirit, Home/Scurry wishes to comply with all chronological and technical direction provided by the Department of Energy and Mines. However, we must ensure that future development in the South Pierson field is both economically viable and consistent with Home/Scurry's present corporate strategy.

If you have any questions or require any further information from Home/Scurry, please contact the undersigned at (403) 232-7337 or Mr. C.W. (Curt) Labelle at (403) 232-7457.

Sincerely,  
HOME OIL COMPANY LIMITED  
SCURRY-RAINBOW OIL LIMITED

CWL/cwl

  
\_\_\_\_\_  
D.A. Cairns  
Area Engineer

# UNDER THE HIGHWAYS PROTECTION ACT AND THE HIGHWAY TRAFFIC ACT

## THE HIGHWAY TRAFFIC BOARD

Notice is hereby given that a hearing of the Highway Traffic Board will be held on Tuesday, October 29, 1991 at 10:00 hours in Room 204-301 Weston Street, Entrance "D", Winnipeg, Manitoba R3E 3H4. Phone: 945-8912.

## Permits — Part I — Section 9 H.P.A. and Part III — Section 17 H.P.A.

### 12/044/122/AB/91 — Bruce Young

An application for a Dwelling, Garage, Well and Access Driveway (Residential) onto Stevens Road adjacent to P.T.H. No. 44, R.L. 100, Lot 22, Block 1, Plan 1489, Parish of St. Andrews, R.M. of St. Andrews.

### 03/003/130/B/91 — Murray Billing

An application for an Addition to an Existing Building adjacent to P.T.H. No. 3, Lot 1, Plan 1770, S.W. ¼, Section 19-6-4 West, R.M. of Dufferin.

### 06/026/131/B/91 — R.M. of St. Francois Xavier

An application for a Public Walkway adjacent to P.T.H. No. 26, Lot A, R.L. 182, Plan 4781, Parish of St. Francois Xavier, R.M. of St. Francois Xavier.

### 12/003/132/B/91 — Petro Canada Inc.

An application for an Addition to an Existing Restaurant (Commercial) adjacent to P.T.H. No. 3 at its intersection with P.T.H. No. 100, W ½, Section 30-9-2 East, R.M. of MacDonald (Oak Bluff).

### 12/101/133/A/91 — George & Ruth Streilein

An application for Two (2) Access Driveways (Agricultural) onto P.T.H. No. 101 (Service Road) R.L.'s 1 & 2, Lots A & B, Parish of St. Paul, R.M. of West St. Paul.

### 02/012/134/B/91 — Verna Kittleson

An application for a Parking Lot, Security Fencing and Temporary Trailer (Commercial) adjacent to P.T.H. No. 12, S.E. ¼, Section 4-1-16 East, L.G.D. of Piney.

### 02/012/085/S/91 — Verna Kittleson

An application for an On-Premise Sign (Commercial) adjacent to P.T.H. No. 12, S.E. ¼, Section 4-1-16 East, L.G.D. of Piney.

### 06/006/135/B/91 — D. E. Andrews

An application for a Single Gas Pump, Single Light Standard and an Underground Storage Tank (Commercial) adjacent to P.T.H. No. 6, S.E. ¼, Section 6-14-1 West, R.M. of Woodlands.

### 06/006/086/S/91 — D. E. Andrews

An application for an On-Premise Sign (Commercial) adjacent to P.T.H. No. 6, S.E. ¼, Section 6-14-1 West, R.M. of Woodlands.

### 04/010/136/B/91 — Wayne Coxsworth

An application for a Temporary Duty Free Trailer (Commercial) adjacent to P.T.H. No. 10, S.W. ¼, Section 2-1-20 West, R.M. of Morton.

### 08/005/137/B/91 — Jeanette Lehky

An application for the Removal of Four (4) Existing Underground Storage Tanks, Replace with Two (2) Underground Storage Tanks and an Addition to an Existing Building (Residential/Commercial) adjacent to P.T.H. No. 5, N.W. ¼, Section 18-25-23 West, R.M. of Grandview (Grandview).

### 02/052/083/S/91 — Alltemp Auto Electric

An application for an Off-Premise Sign (Commercial) adjacent to P.T.H. No. 52, S.E. ¼, Section 31-6-7 East, R.M. of LaBroquerie.

### 03/002/084/S/91 — Manitoba Pool Elevators

An application for an Off-Premise Sign (Commercial) adjacent to P.T.H. No. 2, S.E. ¼, Section 30-8-4 West, R.M. of Grey (Elm Creek).

### 02/075/087/S/91 — Mediacom Inc.

An application for an Off-Premise Sign (Other) adjacent to P.T.H. No. 75, R.L. 62, Parish of St. Norbert, R.M. of Ritchot.

### 05/001/088/S/91 — Town of Virden

An application for an Off-Premise Sign (Commercial) adjacent to P.T.H. No. 1, S.E. ¼, Section 13-10-26 West, R.M. of Wallace.

### Speed Zones — Sections 97 and 98 H.T.A.

#### 19000-S — R.M. of Springfield

Consideration to be given to a reduced restricted speed area of 30 Km/h on all streets within the west half of Section 22-11-5 East in the community of Oakbank, R.M. of Springfield.

The Highway Traffic Board will be prepared to consider all submissions written or oral on the above applications by contacting the Secretary prior to or at the hearing.

A. POLTARUK, MMM CD  
Secretary,

13866—42

THE HIGHWAY TRAFFIC BOARD.

## UNDER THE MINES ACT

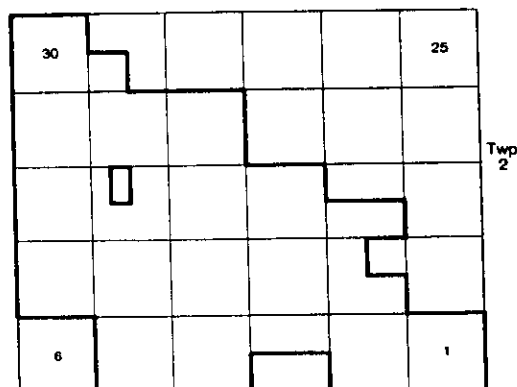
### NOTICE

Home Oil Company Limited ("Home") has made application under subsection 51(3) of The Petroleum Drilling and Petroleum Regulation for an increase in maximum permissible production rates for wells producing from the Lower Amaranth and Mission Canyon Formations and located in the area of application outlined below.

Board Order No. 80A which established interim rates of 14 m<sup>3</sup> of clean oil per day and 360 m<sup>3</sup> of clean oil per month for wells producing from the Lower Amaranth Formation in the Pierson area expires October 31, 1991. Home has proposed that maximum permissible production rates established under Board Order No. 80A be continued for wells producing from the Lower Amaranth and extended to wells producing from the Mission Canyon Formation in the area of application.

Board Order No. 80A is extended until the Board has completed its review of and made a decision on the application.

### PIERSON AREA



Rge. 29(WPM)

Area of application

If a valid intervention or objection in writing is received by the Board at Room 309, Legislative Building, Winnipeg, Manitoba, R3V 0V8 before November 12, 1991, the Board may approve the application.

Copies of the applications can be obtained from:

Home Oil Company Limited

324-8th Avenue S.W.

Calgary, Alberta

T2P 2Z5

Attention: Mr. Jan Olthof, P. Eng.

Phone: (403) 232-7100

The applications can be viewed at the offices of the Petroleum Branch:

555-330 Graham Avenue

Waskada, Manitoba

Winnipeg, Manitoba

R0M 2E0

R3C 4E3

Phone: (204) 945-6577

Phone: (204) 673-2472

Dated at Winnipeg, this 10th day of October, 1991.

H. CLARE MOSTER,

Deputy Chairman.

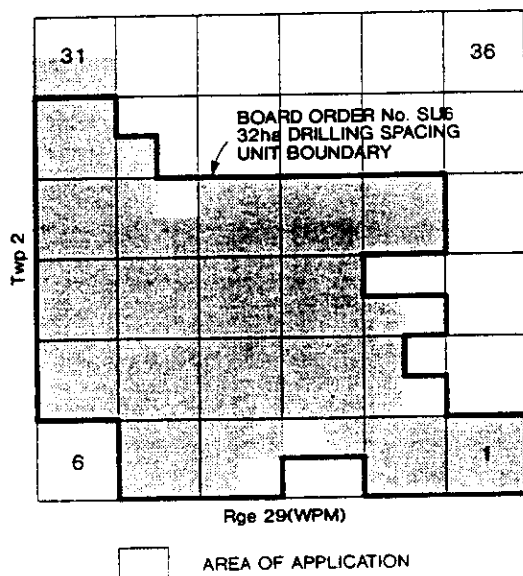
13936—42

### NOTICE

Home Oil Company Limited ("Home") and Tundra Oil and Gas Ltd. ("Tundra") have made application separately under subsection 20(1) of The Petroleum Drilling and Production Regulation for continuation of special drilling spacing units in the Pierson area.

Board Order No. SU6 which established temporary special 32 hectare drilling spacing units for the Lower Amaranth Formation in the Pierson area expires October 31, 1991. Home and Tundra have proposed that 32 hectare drilling spacing be continued for production for the Lower Amaranth Formation. Home has also proposed that drilling spacing units for the Mission Canyon be increased in size from 16 to 32 hectares.

The area of applications and area covered by Board Order No. SU6 is outlined below.



Individual drilling spacing units would consist of a north-south pair of Legal Subdivisions (e.g. Lsd's 1 and 8, Lsd's 2 and 7, etc.) The proposed target area for the 32 hectare drilling spacing units would be located in the even numbered Legal Subdivisions and would be of the same size and location as if that Legal Subdivision was a 16 hectare drilling spacing unit.

The Board in its review of the applications will be considering the merits of each of the following proposals:

(1) continuation of 32 hectare drilling spacing units for the Lower Amaranth Formation only in the area of application and in the area covered by Board Order No. SU6, and

(2) establishment of 32 hectare drilling spacing units for the Mission Canyon Formation, in the area of application and in the area covered by Board Order No. SU6.

Board Order No. SU6 is extended until the Board has completed its review of and make a decision on the applications.

If no valid intervention or objection in writing is received by the Board at Room 309, Legislative Building, Winnipeg, Manitoba, R3V 0V8 before November 12, 1991, the Board may approve the applications.

Copies of the applications can be obtained from:

Home Oil Company Limited

Tundra Oil and Gas Ltd.

324-8th Avenue S.W.

1313-One Lombard Place

Calgary, Alberta

Winnipeg, Manitoba

T2P 2Z5

R3B 0X3

Attention: Mr. Jan Olthof,

Attention: Mr. Dan Barchyn

P. Eng.

Phone: (204) 934-5850

Phone: (403) 232-7100

The applications can be viewed at the offices of the Petroleum Branch:

555-330 Graham Avenue

Waskada, Manitoba

Winnipeg, Manitoba

R0M 2E0

R3C 4E3

Phone: (204) 945-6577

Phone: (204) 673-2472

Dated at Winnipeg, this 10th day of October, 1991.

H. CLARE MOSTER,

Deputy Chairman.

13937—42

October 10, 1991

The Oil and Natural Gas  
Conservation Board

- Ian Haugh, Chairman
- H. Clare Moster, Deputy Chairman
- Wm. McDonald, Member

John N. Fox  
Chief Petroleum Engineer  
Petroleum Branch

RE: Pierson Area  
Application for Extension of 32 ha Spacing

Home Oil Company Limited has made application (91-09-26) for continuation of 32 ha spacing in the Pierson area and for continuation of a maximum permissible production rate (MPPR) of 14 m<sup>3</sup>/d and 360 m<sup>3</sup>/month. Home's application covers both the Lower Amaranth and Mission Canyon Formations.

Tundra Oil and Gas Ltd. has also applied for continuation of 32 ha spacing for the Lower Amaranth Formation in the Pierson area.

The area of application for Home Oil and Tundra is shown in Figure 1.

#### RECOMMENDATIONS:

It is recommended that notice of the spacing applications and MPPR application be published separately in the Manitoba Gazette, the Melita New Era and the Deloraine Times and Star. Copies of the proposed notices are attached.

The notice contains a statement indicating Board Order No.'s SU6 and 80A, due to expire on October 31, 1991, are continued until the Board has disposed of the applications.

A copy of the notices will be sent directly to the lessors and lessees in and within 1.0 kilometres of the areas of applications.

#### DISCUSSION

Board Order No. SU5 (October 4, 1989) established temporary special 32 ha spacing units in the Pierson area for an interim period ending October 31, 1991. Upon application by Home Oil and Tundra, 32 ha spacing was extended under Board Order No. SU6 (July 27, 1990) to include additional adjoining lands. The approval under Board Order No. SU6 was also for an interim period ending October 31, 1991. Figure 2 shows the area approved for 32 ha spacing under Board Order No. SU6.

A comparison between Figure 1, the area of application, and Figure 2 indicates the NW/4 of Section 3, SE/4 of Section 4, SE/4 of Section 11, SE/4 of Section 14 and the NE/4 of Section 20 which are included in Board Order No. SU 6 are not included in the area of application. It appears from the application that Home Oil is no longer the lessee of these lands.

Board Order No. 80A provides a temporary increase in MPPR for wells producing from the Lower Amaranth in the Pierson area (Figure 3) for an interim period ending October 31, 1991. Home Oil has applied for continuation of the MPPR increase for the Lower Amaranth and extension of the increase to wells producing from the Mission Canyon.

It is proposed to publish separate notices of the spacing and MPPR applications. With respect to the spacing applications, it is suggested that notice of the applications address the following matters:

- (1) continuation of 32 hectare spacing for the Lower Amaranth for the area of application and for the area covered by Board Order No. SU6, and
- (2) extension of 32 hectare spacing for the Mission Canyon for the area of application and for the area covered by Board Order SU6.

Extending the Branch's review to encompass the above matters ensures a consistent treatment, in terms of depletion strategy, for all lands within the productive limits of the Lower Amaranth and Mission Canyon pools. A copy of the proposed notice is attached.

Separate and coincidental notice of the MPPR application is proposed to avoid confusion between the area of application for spacing and for an increase in MPPR. A copy of the proposed notice for an increase in MPPR is attached.

A preliminary review of the applications indicates neither company has filed sufficient technical information in support of its application. Due to the pending expiry of Board Order No.'s SU6 and 80A, it is recommended that notice of the applications be published as soon as possible and any deficiencies addressed at a later date. This will not effect the content of the notices.

The Branch anticipates the review and final disposition of the applications will extend beyond the expiry date of the Board Orders. Therefore, it is recommended that in the notice the Board provide for extension of the orders until such time as the application has been disposed of.

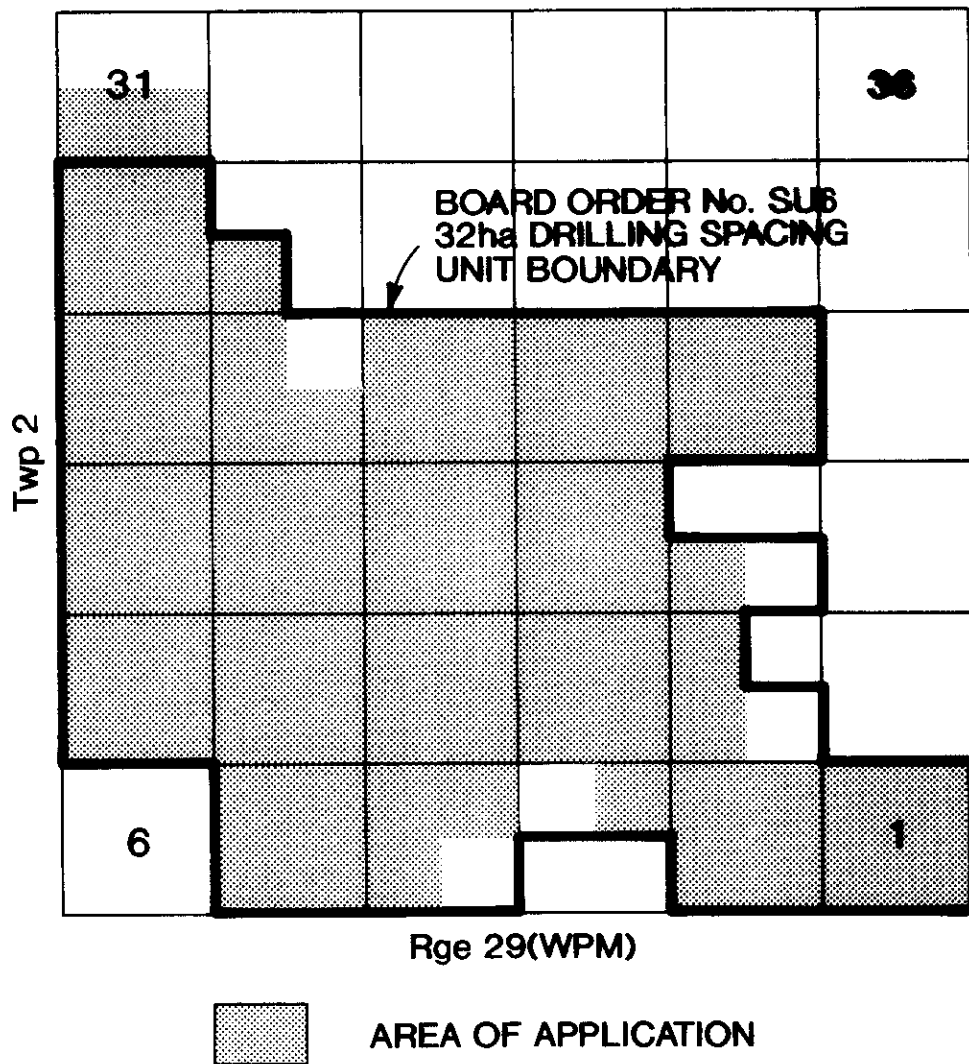
John N. Fox

Original Signed  
L. R. Dubreuil

Approved: \_\_\_\_\_

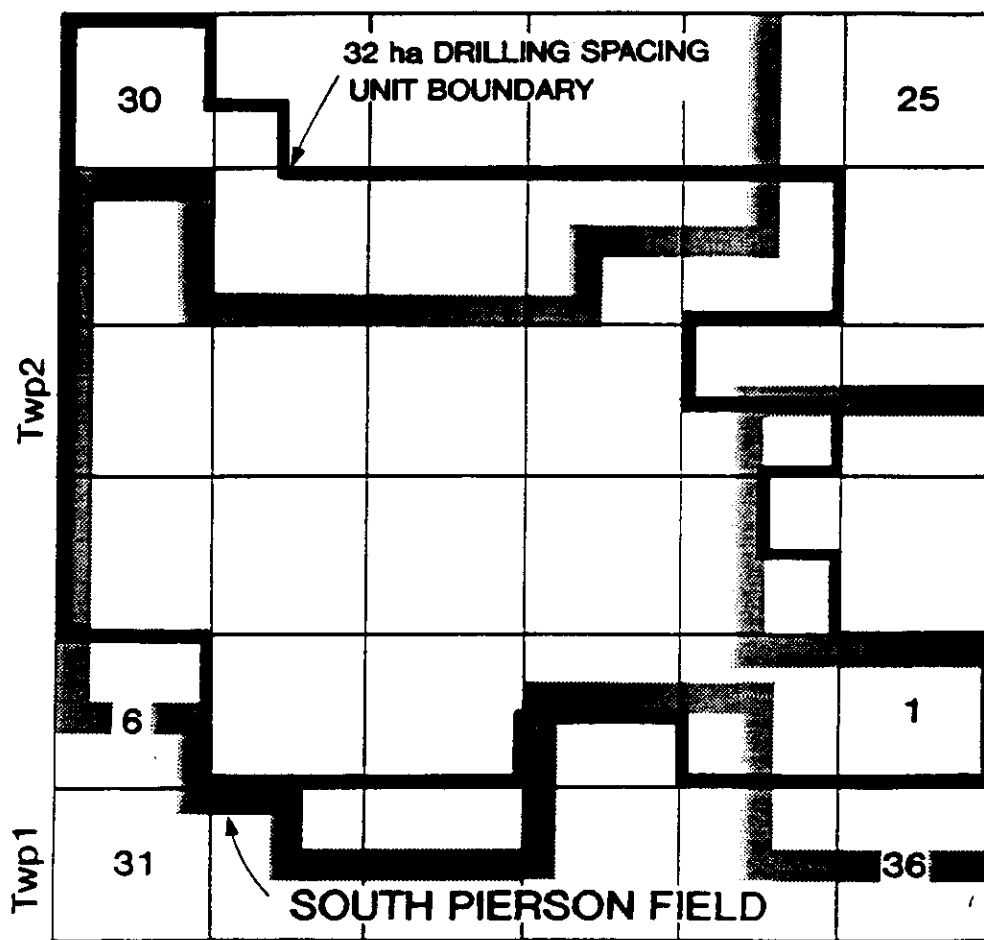
L.R. Dubreuil, Director

FIGURE NO. 1



BOARD ORDER NO. SU 6  
SCHEDULE A

SOUTH PIERSON AREA  
32 ha DRILLING SPACING UNITS  
LOWER AMARANTH FORMATION

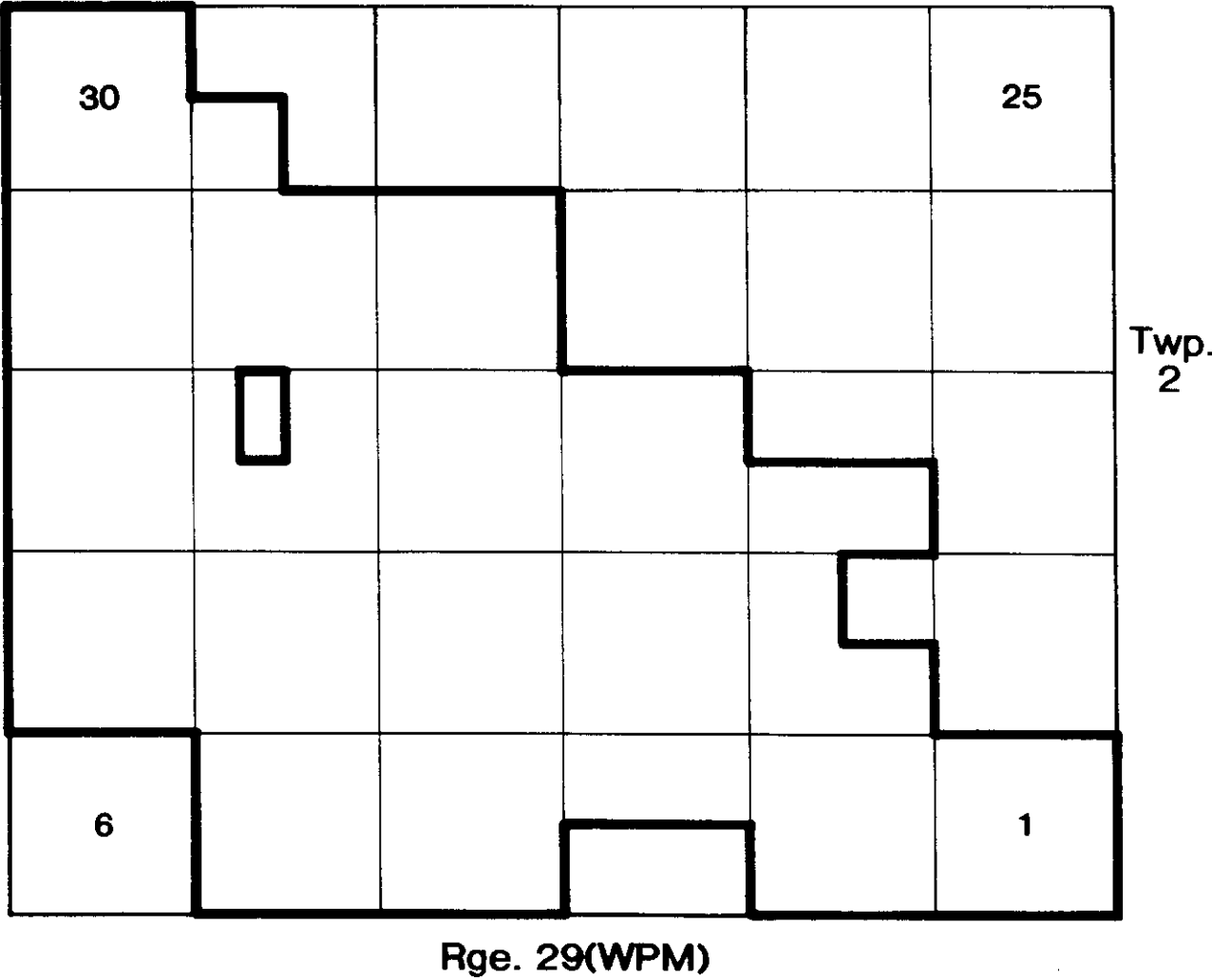


Rge29(WPM)



FIGURE NO. 3

PIERSON AREA



— Area of application



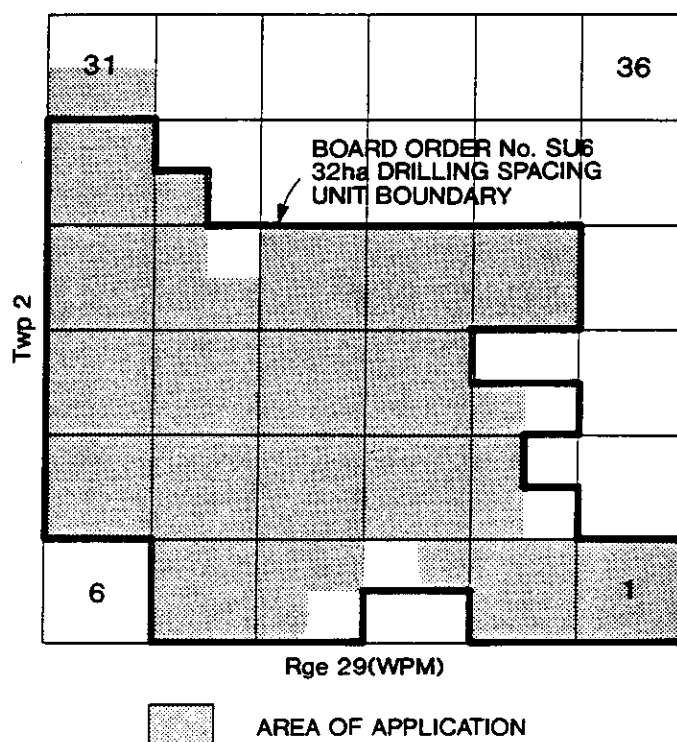
**NOTICE**  
**UNDER THE MINES ACT**

Home Oil Company Limited ("Home") and Tundra Oil and Gas Ltd. ("Tundra") have made application separately under subsection 20(1) of The Petroleum Drilling and Production Regulation for continuation of special drilling spacing units in the Pierson area.

Board Order No. SU6 which established temporary special 32 hectare drilling spacing units for the Lower Amaranth Formation in the Pierson area expires October 31, 1991. Home and Tundra have proposed that 32 hectare drilling spacing be continued for production for the Lower Amaranth Formation. Home has also proposed that drilling spacing units for the Mission Canyon be increased in size from 16 to 32 hectares.

The area of applications and area covered by Board Order No. SU6 is outlined below.

Individual drilling spacing units would consist of a north-south pair of Legal Subdivisions (e.g. Lsd's 1 and 8, Lsd's 2 and 7, etc). The proposed target area for the 32 hectare drilling spacing units would be located in the even numbered Legal Subdivisions and would be of the same size and location as if that Legal Subdivision was a 16 hectare drilling spacing unit.



The Board in its review of the applications will be considering the merits of each of the following proposals:

- (1) continuation of 32 hectare drilling spacing units for the Lower Amaranth Formation only in the area of application and in the area covered by Board Order No. SU6, and
- (2) establishment of 32 hectare drilling spacing units for the Mission Canyon Formation, in the area of application and in the area covered by Board Order No. SU6.

Board Order No. SU6 is extended until the Board has completed its review of and made a decision on the applications.

If no valid intervention or objection in writing is received by the Board at Room 309, Legislative Building, Winnipeg, Manitoba, R3V 0V8 before November 12, 1991, the Board may approve the applications.

Copies of the applications can be obtained from:

Home Oil Company Limited  
324 - 8th Avenue S.W.  
Calgary, Alberta  
T2P 2Z5

Tundra Oil and Gas Ltd.  
1313 - One Lombard Place  
Winnipeg, Manitoba  
R3B 0X3

Attention: Mr. Jan Olthof, P. Eng.  
Phone: (403) 232-7100

Attention: Mr. Dan Barchyn  
Phone: (204) 934-5850

The applications can be viewed at the offices of the Petroleum Branch:

555-330 Graham Avenue  
Winnipeg, Manitoba  
R3C 4E3

Waskada, Manitoba  
ROM 2E0

Phone: (204) 945-6577

Phone: (204) 673-2472

Dated at Winnipeg, this 10<sup>TH</sup> day of OCTOBER, 1991.



H. Clare Moster  
Deputy Chairman



## NOTICE

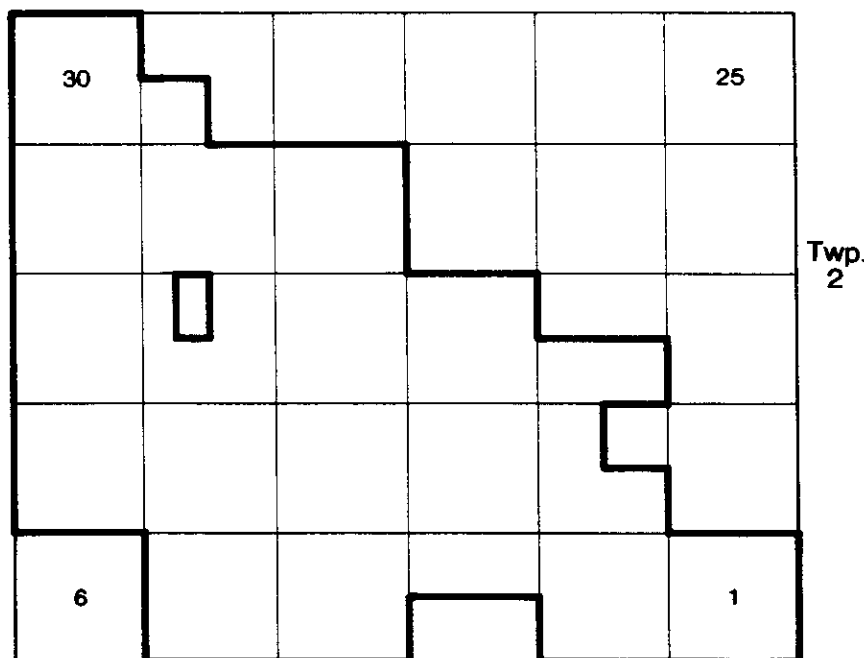
### UNDER THE MINES ACT

Home Oil Company Limited ("Home") has made application under subsection 51(3) of The Petroleum Drilling and Production Regulation for an increase in maximum permissible production rates for wells producing from the Lower Amaranth and Mission Canyon Formations and located in the area of application outlined below.

Board Order No. 80A which established interim rates of 14 m<sup>3</sup> of clean oil per day and 360 m<sup>3</sup> of clean oil per month for wells producing from the Lower Amaranth Formation in the Pierson area expires October 31, 1991. Home has proposed that maximum permissible production rates established under Board Order No. 80A be continued for wells producing from the Lower Amaranth and extended to wells producing from the Mission Canyon Formation in the area of application.

Board Order No. 80A is extended until the Board has completed its review of and made a decision on the application.

### PIERSON AREA



Rge. 29(WPM)

— Area of application

If no valid intervention or objection in writing is received by the Board at Room 309, Legislative Building, Winnipeg, Manitoba, R3V 0V8 before November 12, 1991, the Board may approve the application.

Copies of the applications can be obtained from:

Home Oil Company Limited  
324 - 8th Avenue S.W.  
Calgary, Alberta  
T2P 2Z5

Attention: Mr. Jan Olthof, P. Eng.  
Phone: (403) 232-7100

The applications can be viewed at the offices of the Petroleum Branch:

555-330 Graham Avenue  
Winnipeg, Manitoba  
R3C 4E3

Phone: (204) 945-6577

Waskada, Manitoba  
ROM 2E0

Phone: (204) 673-2472

Dated at Winnipeg, this 10<sup>th</sup> day of OCTOBER, 1991.



H. Clare Moster  
Deputy Chairman



## NOTICE

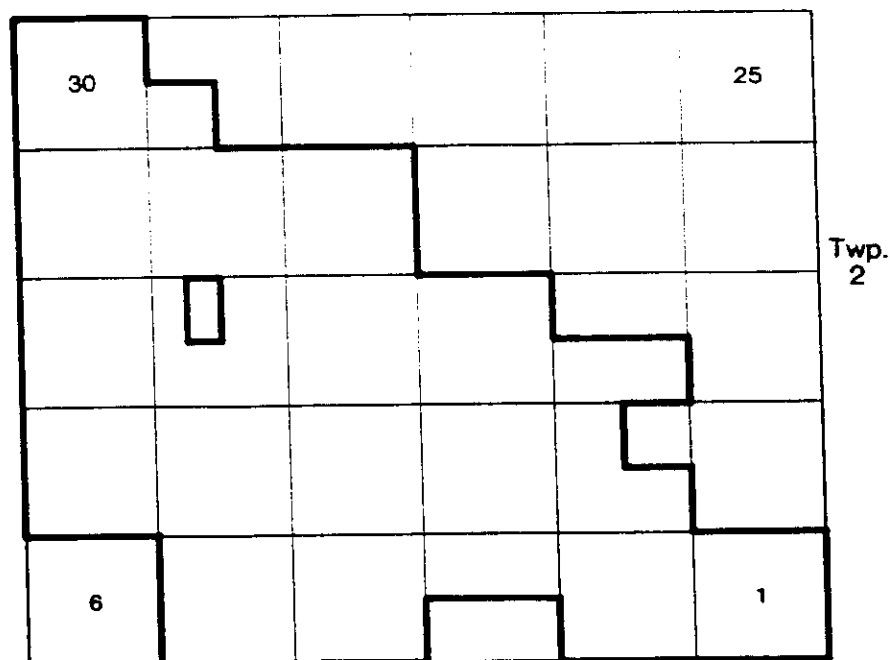
### UNDER THE MINES ACT

Home Oil Company Limited ("Home") has made application under subsection 51(3) of The Petroleum Drilling and Production Regulation for an increase in maximum permissible production rates for wells producing from the Lower Amaranth and Mission Canyon Formations and located in the area of application outlined below.

Board Order No. 80A which established interim rates of 14 m<sup>3</sup> of clean oil per day and 360 m<sup>3</sup> of clean oil per month for wells producing from the Lower Amaranth Formation in the Pierson area expires October 31, 1991. Home has proposed that maximum permissible production rates established under Board Order No. 80A be continued for wells producing from the Lower Amaranth and extended to wells producing from the Mission Canyon Formation in the area of application.

Board Order No. 80A is extended until the Board has completed its review of and made a decision on the application.

### PIERSON AREA



Rge. 29(WPM)

————— Area of application

If no valid intervention or objection in writing is received by the Board at Room 309, Legislative Building, Winnipeg, Manitoba, R3V 0V8 before November 12, 1991, the Board may approve the application.

Copies of the applications can be obtained from:

Home Oil Company Limited  
324 - 8th Avenue S.W.  
Calgary, Alberta  
T2P 2Z5

Attention: Mr. Jan Olthof, P. Eng.  
Phone: (403) 232-7100

The applications can be viewed at the offices of the Petroleum Branch:

555-330 Graham Avenue  
Winnipeg, Manitoba  
R3C 4E3

Waskada, Manitoba  
ROM 2E0

Phone: (204) 945-6577

Phone: (204) 673-2472

Dated at Winnipeg, this 10<sup>th</sup> day of OCTOBER, 1991.



H. Clare Moster  
Deputy Chairman



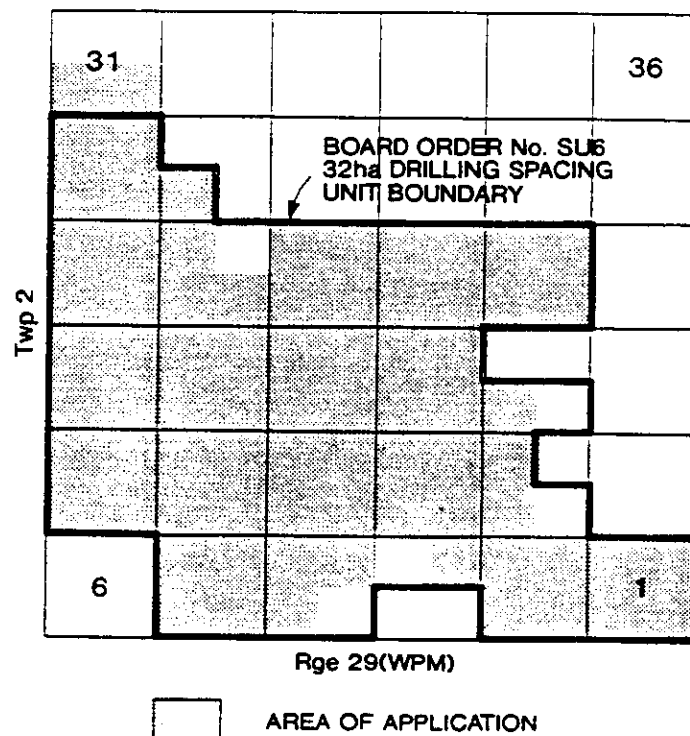
## NOTICE UNDER THE MINES ACT

Home Oil Company Limited ("Home") and Tundra Oil and Gas Ltd. ("Tundra") have made application separately under subsection 20(1) of The Petroleum Drilling and Production Regulation for continuation of special drilling spacing units in the Pierson area.

Board Order No. SU6 which established temporary special 32 hectare drilling spacing units for the Lower Amaranth Formation in the Pierson area expires October 31, 1991. Home and Tundra have proposed that 32 hectare drilling spacing be continued for production for the Lower Amaranth Formation. Home has also proposed that drilling spacing units for the Mission Canyon be increased in size from 16 to 32 hectares.

The area of applications and area covered by Board Order No. SU6 is outlined below.

Individual drilling spacing units would consist of a north-south pair of Legal Subdivisions (e.g. Lsd's 1 and 8, Lsd's 2 and 7, etc). The proposed target area for the 32 hectare drilling spacing units would be located in the even numbered Legal Subdivisions and would be of the same size and location as if that Legal Subdivision was a 16 hectare drilling spacing unit.





The Board in its review of the applications will be considering the merits of each of the following proposals:

- (1) continuation of 32 hectare drilling spacing units for the Lower Amaranth Formation only in the area of application and in the area covered by Board Order No. SU6, and
- (2) establishment of 32 hectare drilling spacing units for the Mission Canyon Formation, in the area of application and in the area covered by Board Order No. SU6.

Board Order No. SU6 is extended until the Board has completed its review of and made a decision on the applications.

If no valid intervention or objection in writing is received by the Board at Room 309, Legislative Building, Winnipeg, Manitoba, R3V 0V8 before November 12, 1991, the Board may approve the applications.

Copies of the applications can be obtained from:

Home Oil Company Limited  
324 - 8th Avenue S.W.  
Calgary, Alberta  
T2P 2Z5

Tundra Oil and Gas Ltd.  
1313 - One Lombard Place  
Winnipeg, Manitoba  
R3B 0X3

Attention: Mr. Jan Olthof, P. Eng.  
Phone: (403) 232-7100

Attention: Mr. Dan Barchyn  
Phone: (204) 934-5850

The applications can be viewed at the offices of the Petroleum Branch:

555-330 Graham Avenue  
Winnipeg, Manitoba  
R3C 4E3

Waskada, Manitoba  
ROM 2E0

Phone: (204) 945-6577

Phone: (204) 673-2472

Dated at Winnipeg, this 10<sup>TH</sup> day of OCTOBER, 1991.



H. Clare Moster  
Deputy Chairman

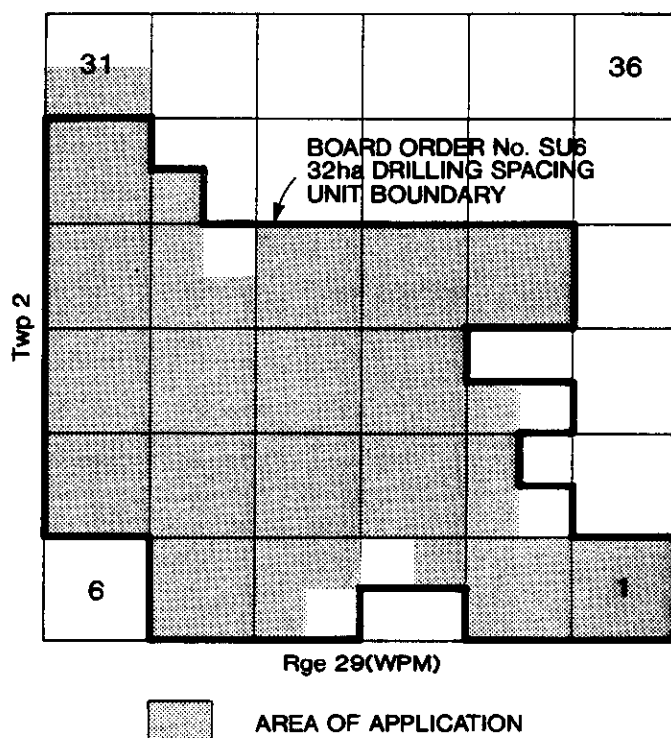
**NOTICE**  
**UNDER THE MINES ACT**

Home Oil Company Limited ("Home") and Tundra Oil and Gas Ltd. ("Tundra") have made application separately under subsection 20(1) of The Petroleum Drilling and Production Regulation for continuation of special drilling spacing units in the Pierson area.

Board Order No. SU6 which established temporary special 32 hectare drilling spacing units for the Lower Amaranth Formation in the Pierson area expires October 31, 1991. Home and Tundra have proposed that 32 hectare drilling spacing be continued for production for the Lower Amaranth Formation. Home has also proposed that drilling spacing units for the Mission Canyon be increased in size from 16 to 32 hectares.

The area of applications and area covered by Board Order No. SU6 is outlined below.

Individual drilling spacing units would consist of a north-south pair of Legal Subdivisions (e.g. Lsd's 1 and 8, Lsd's 2 and 7, etc). The proposed target area for the 32 hectare drilling spacing units would be located in the even numbered Legal Subdivisions and would be of the same size and location as if that Legal Subdivision was a 16 hectare drilling spacing unit.



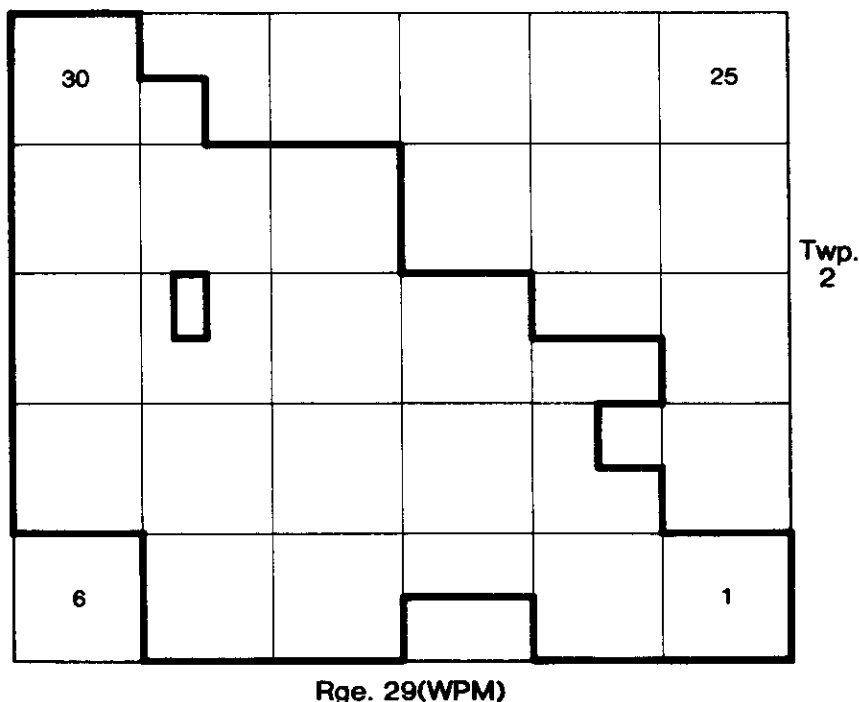
**NOTICE**  
**UNDER THE MINES ACT**

Home Oil Company Limited ("Home") has made application under subsection 51(3) of The Petroleum Drilling and Production Regulation for an increase in maximum permissible production rates for wells producing from the Lower Amaranth and Mission Canyon Formations and located in the area of application outlined below.

Board Order No. 80A which established interim rates of 14 m<sup>3</sup> of clean oil per day and 360 m<sup>3</sup> of clean oil per month for wells producing from the Lower Amaranth Formation in the Pierson area expires October 31, 1991. Home has proposed that maximum permissible production rates established under Board Order No. 80A be continued for wells producing from the Lower Amaranth and extended to wells producing from the Mission Canyon Formation in the area of application.

Board Order No. 80A is extended until the Board has completed its review of and made a decision on the application.

**PIERSON AREA**



————— Area of application



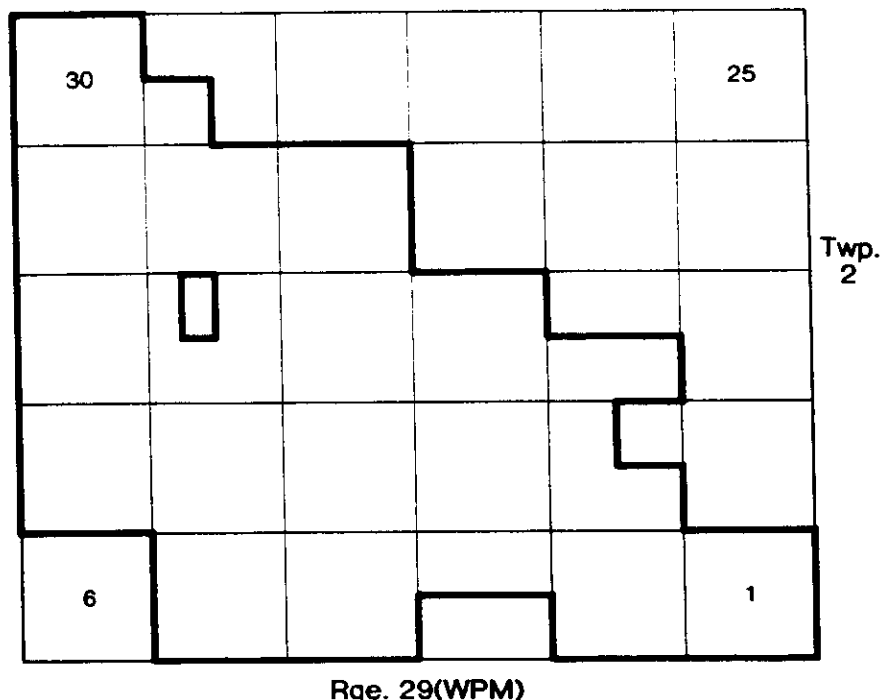
**NOTICE**  
**UNDER THE MINES ACT**

Home Oil Company Limited ("Home") has made application under subsection 51(3) of The Petroleum Drilling and Production Regulation for an increase in maximum permissible production rates for wells producing from the Lower Amaranth and Mission Canyon Formations and located in the area of application outlined below.

Board Order No. 80A which established interim rates of 14 m<sup>3</sup> of clean oil per day and 360 m<sup>3</sup> of clean oil per month for wells producing from the Lower Amaranth Formation in the Pierson area expires October 31, 1991. Home has proposed that maximum permissible production rates established under Board Order No. 80A be continued for wells producing from the Lower Amaranth and extended to wells producing from the Mission Canyon Formation in the area of application.

Board Order No. 80A is extended until the Board has completed its review of and made a decision on the application.

**PIERSON AREA**



— Area of application

If no valid intervention or objection in writing is received by the Board at Room 309, Legislative Building, Winnipeg, Manitoba, R3V 0V8 before November 12, 1991, the Board may approve the application.

Copies of the applications can be obtained from:

Home Oil Company Limited  
324 - 8th Avenue S.W.  
Calgary, Alberta  
T2P 2Z5

Attention: Mr. Jan Olthof, P. Eng.  
Phone: (403) 232-7100

The applications can be viewed at the offices of the Petroleum Branch:

555-330 Graham Avenue  
Winnipeg, Manitoba  
R3C 4E3

Waskada, Manitoba  
ROM 2E0

Phone: (204) 945-6577

Phone: (204) 673-2472

Dated at Winnipeg, this 10<sup>th</sup> day of OCTOBER, 1991.



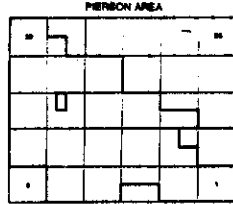
H. Clare Moster  
Deputy Chairman

## NOTICE UNDER THE MINES ACT

Home Oil Company Limited ("Home") has made application under subsection 51(3) of the Petroleum Drilling and Production Regulation for an increase in maximum permissible production rates for wells producing from the Lower Amaranth and Mission Canyon Formations and located in the area of application outlined below.

Board Order No. 80A which established interim rates of 14 m<sup>3</sup> of clean oil per day and 360 m<sup>3</sup> of clean oil per month for wells producing from the Lower Amaranth Formation in the Pierson area expires October 31, 1991. Home has proposed that maximum permissible production rates established under Board Order No. 80A be continued for wells producing from the Lower Amaranth and extended to wells producing from the Mission Canyon Formation in the area of application.

Board Order No. 80A is extended until the Board has completed its review of and made a decision on the application.



Area of application

If no valid intervention of objection in writing is received by the Board at Room 309, Legislative Building, Winnipeg, Manitoba, R3V 0V8 before November 12, 1991, the Board may approve the application.

Copies of the applications can be obtained from:

Home Oil Company Limited

324-8th Avenue S.W.,

Calgary, Alberta, T2P 2Z5

Attention: Mr. Jan Olthof, P. Eng.

Phone: (403) 232-7100

The applications can be viewed at the offices at the Petroleum Branch:

555-330 Graham Avenue

Winnipeg, Manitoba

R3C 4E3

Phone: (204) 945-6577

Waskada, Manitoba

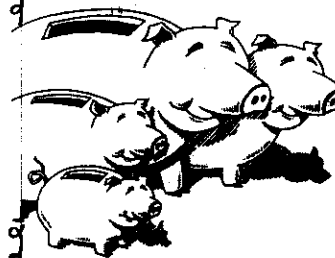
ROM 2E0

Phone: (204) 573-2472

Dated at Winnipeg, this 10th day of October, 1991.

H. Clare Moster

Deputy Chairman



### MAKE GIVING A FAMILY AFFAIR

Local Heroes know that when everyone in your family helps decide which causes to support, everyone shares in the rewards of giving.

Make giving a part of your family plans and family budget. You'll all be Local Heroes.



A New Spirit of Giving

A national program to encourage giving and volunteering.

**MON. OCT. 28, WED.**

5 & 6 year olds and be

7,8,9,10 year old

10,11,12 & 13 year

14,15,16,17 year o

**SAT**

Group 1

Group 2

Group 3

Public Sk

Group 4

**SUN., November 3, P**

Conditioning camp is free fo

schools and out of town Pla

Deloraine teams.

There will be a \$10.00 c

For more in

**Clark Tweed 665-241**

**Barry Dalry**

## FIESTA DRAPER

### 25% OFF October

Venetians, Verticals, Pleated and

### 25% Off Sheer Fabr

**ORDER NOW FOR CHRISTMA**

**Ask about our Clearance V**

Shirley Christensen - Custo

## SOUTHWEST

Goodland



*John - see other side also.*

# NOTICE

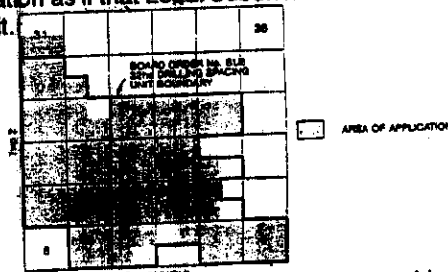
## UNDER THE MINES ACT

Home Oil Company Limited ("Home") and Tundra Oil and Gas Ltd. ("Tundra") have made application separately under subsection 20(1) of The Petroleum Drilling and Production Regulation for continuation of special drilling spacing units in the Pierson area.

Board Order No. Su6 which established temporary special 32 hectare drilling spacing units for the Lower Amaranth Formation in the Pierson area expires October 31, 1991. Home and Tundra have proposed that 32 hectare drilling spacing be continued for production for the Lower Amaranth Formation. Home has also proposed that drilling spacing units for the Mission Canyon be increased in size from 16 to 32 hectares.

The area of applications and area covered by Board Order No. Su6 is outlined below.

Individual drilling spacing units would consist of a north-south pair of Legal Subdivisions (e.g. Lsd's 1 and 8, Lsd's 2 and 7, etc). The proposed target area for the 32 hectare drilling spacing units would be located in the even numbered Legal Subdivisions and would be of the same size and location as if that Legal Subdivision was a 16 hectare drilling spacing unit.



The Board in its review of the applications will be considering the merits of each of the following proposals:

- (a) continuation of 32 hectare drilling spacing units for the Lower Amaranth Formation only in the area of application and in the area covered by Board Order No. Su6, and
- (2) establishment of 32 hectare drilling spacing units for the Mission Canyon Formation, in the area of application and in the area covered by Board Order No. SU6.

Board Order No. SU6 is extended until the Board has completed its review of and made a decision on the applications.

If no valid intervention or objection in writing is received by the Board at Room 309, Legislative Building, Winnipeg, Manitoba, R3V 0V8 before November 12, 1991, the Board may approve the applications.

Copies of the applications can be obtained from:

Home Oil Company Limited  
324-8th Avenue S.W.  
Calgary, Alberta  
T2P 2Z5

Tundra Oil and Gas Ltd.  
1313 - One Lombard Place  
Winnipeg, Manitoba  
R3B 0X3

Attention:  
Mr. Jan Olthoff, P. Eng.  
Phone: (403) 232-7100

Attention: Mr. Dan Barchyn  
Phone: (204) 934-5850

The applications can be viewed at the offices of the Petroleum

Branch:  
555-330 Graham Avenue  
Winnipeg, Manitoba  
R3C 4E3

Waskada, Manitoba  
R0M 2E0

Phone: (204) 945-6577

Phone: (204) 673-2472

Dated at Winnipeg, this 10th day of October, 1991.

H. Clare Moster  
Deputy Chairperson

# at 12 Bruce Street, Melita Sunday, October 27

2:00 to 4:00 p.m.

The public are invited to come and view this lovely modern 2 bedroom bungalow for sale by:

**Pat Taylor**

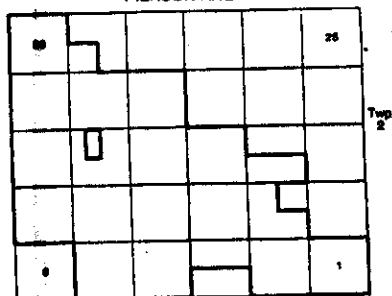
Rural Realty—Reston, MB.  
phone 877-3834

## NOTICE—Under the Mines Act

Home Oil Company Limited ("Home") has made application under subsection 51(3) of The Petroleum Drilling and Production Regulation for an increase in maximum permissible production rates for wells producing from the Lower Amaranth and Mission Canyon Formations and located in the area of application outlined below.

Board Order No. 80A which established interim rates of 14 m<sup>3</sup> of clean oil per day and 360 m<sup>3</sup> of clean oil per month for wells producing from the Lower Amaranth Formation in the Pierson area expires October 31, 1991. Home has proposed that maximum permissible production rates established under Board Order No. 80A be continued for wells producing from the Lower Amaranth and extended to wells producing from the Mission Canyon Formation in the area of application.

PIERSON AREA



Area of application

Board Order No. 80A is extended until the Board has completed its review of and made a decision on the application.

If no valid intervention or objection in writing is received by the Board at Room 309, Legislative Building, Winnipeg, Manitoba, R3V 0V8 before November 12, 1991, the Board may approve the application.

Copies of the applications can be obtained from:

Home Oil Company Limited  
324-8th Avenue S.W.  
Calgary, Alberta  
T2P 2Z5

Attention: Mr. Jan Othof, P. Eng.  
Phone: (403) 232-7300

The applications can be viewed at the offices of the Petroleum Branch:  
555-330 Graham Avenue  
Winnipeg, Manitoba  
R3C 4E3

Phone: (204) 945-0877

Phone: (204) 673-2472

Dated at Winnipeg, this 10th day of October, 1991.

—H. Clare Mosier  
Deputy Chairman

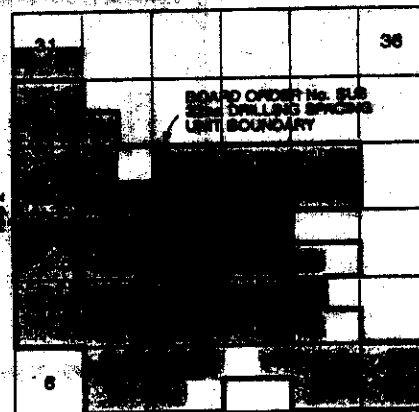
## NOTICE—Under the Mines Act

Home Oil Company Limited ("Home") and Tundra Oil and Gas Ltd. ("Tundra") have made application separately under subsection 28(1) of The Petroleum Drilling and Production Regulation for continuation of special drilling spacing units in the Pierson area.

Board Order No. SU6 which established temporary special 32 hectare drilling spacing units for the Lower Amaranth Formation in the Pierson area expires October 31, 1991. Home and Tundra have proposed that 32 hectare drilling spacing be continued for production for the Lower Amaranth Formation. Home has also proposed that drilling spacing units for the Mission Canyon be increased in size from 16 to 32 hectares.

The area of applications and area covered by Board Order No. SU6 is outlined below.

The proposed drilling spacing units would consist of a north-south pair of Legal Subdivisions (e.g. Lot's 1 and 8, Lot's 2 and 7, etc.). The proposed target area for the 32 hectare drilling spacing units would be located in the even numbered Legal Subdivisions and would be of the same size and location as if that Legal Subdivision was a 16 hectare drilling spacing unit.



AREA OF APPLICATION

The Board in its review of the applications will be considering the merits of each of the following proposals:

- (1) continuation of 32 hectare drilling spacing units for the Lower Amaranth Formation only in the area of application and in the area covered by Board Order No. SU6, and
- (2) establishment of 32 hectare drilling spacing units for the Mission Canyon Formation, in the area of application and in the area covered by Board Order No. SU6.

Board Order No. SU6 is extended until the Board has completed its review of and made a decision on the applications.

If no valid intervention or objection in writing is received by the Board at Room 309, Legislative Building, Winnipeg, Manitoba, R3V 0V8 before November 12, 1991, the Board may approve the applications.

Copies of the applications can be obtained from:

Home Oil Company Limited  
324-8th Avenue S.W.  
Calgary, Alberta  
T2P 2Z5

Attention: Mr. Jan Othof, P. Eng.  
Phone: (403) 232-7100

The applications can be viewed at the offices of the Petroleum Branch:  
555-330 Graham Avenue  
Winnipeg, Manitoba  
R3C 4E3

Phone: (204) 945-6577

Dated at Winnipeg, this 10th day of October, 1991.

Tundra Oil and Gas Ltd.  
1313-Oak Lombard Place  
Winnipeg, Manitoba  
R3B 0X3

Attention: Mr. Dan Barchyn  
Phone: (204) 934-5880

The applications can be viewed at the offices of the Petroleum Branch:  
Waskada, Manitoba  
R0M 2E0

Phone: (204) 673-2472

—H. Clare Mosier  
Deputy Chairman



**Home Oil Company Limited**

1600 Home Oil Tower  
324 Eighth Avenue S.W.  
Calgary, Alberta T2P 2Z5  
Telephone (403) 232-7100  
Fax (403) 232-7678

October 1, 1991

Manitoba Energy and Mines  
Petroleum Branch  
# 555, 330 Graham Avenue  
Winnipeg, Manitoba  
R3C 4K3

Attention: Mr. L.R. Dubreuil, P. Eng.  
Director, Petroleum Branch

Dear Mr. Dubreuil:

RE: South Pierson Field  
Application for Special Drilling Spacing Units and  
Maximum Permissible Production Rate

As promised in our application of this month, please find attached a list of the Mineral Owners within the area of application.

Yours truly,

HOME OIL COMPANY LIMITED

*Sharon Dengler / for*  
D.A. Bertram, P.Eng.  
Chief Engineer  
Southern Production

DAB/sad

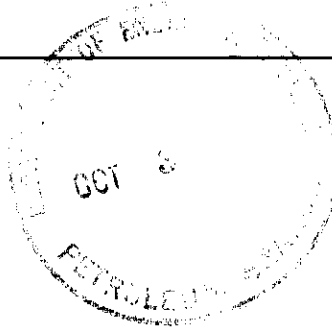
encl

cc: Day File

## SOUTH PIERSON AREA

Address	City	Area Pr Code	Cert. Number	In	bc
P.O. Box 1	Gerald	SK SOA 1B0	12578 U	1/4	I
P.O. Box 855	Malita	MB ROM 1LO	25839 U	1/2	I
P.O. Box 1	Gerald	SK SOA 1B0	12578 U	1/4	I
Box 78, Route 2	Bottineau	ND 58318	25916 U	1/2	I
P.O. Box 1	Gerald	SK SOA 1B0	12578 U	1/2	I
1116 Roscor Avenue	Brandon	MB R7A QL3	28674 U	1/4	I
6215 North 31st Dr.	Pheonix	AZ 85017	28674 U	1/4	I
P.O. Box 1	Gerald	SK SOA 1B0	12578 U	1/4	I
Box 149	Pierson	MB ROM 1SO	182396 U	1/2	I
Box 149	Pierson	MB ROM 1SO	182400 U	1/2	I
Box 149	Pierson	MB ROM 1SO	182396 U	1/2	I
Box 149	Pierson	MB ROM 1SO	182396 U	1/2	I
5438 E. Baltimore	Mesa	AZ 85005	8887	1/2	I
Box 246	Treherne	MB ROG 2VO	50647 U	1/3	I
See Charles Thomas Nicoll	Rosendale		50647 U	1/3	I
See Charles Thomas Nicoll	Chatton	AB	50647 U	1/3	I
Box 246	Treherne	MB ROG 2VO	50648 U	1/3	I
See Charles Thomas Nicoll	Rosendale		50648 U	1/3	I
See Charles Thomas Nicoll	Chatton	AB	50648 U	1/3	I
Box 246	Treherne	MB ROG 2VO	50647 U	1/3	I
See Charles Thomas Nicoll	Rosendale		50647 U	1/3	I
See Charles Thomas Nicoll	Chatton	AB	50647 U	1/3	I
Box 246	Treherne	MB ROG 2VO	50648 U	1/3	I
See Charles Thomas Nicoll	Rosendale		50648 U	1/3	I
See Charles Thomas Nicoll	Chatton	AB	50648 U	1/3	I
Box 252	Pierson	MB ROM 1SO	171168	All	
c/o Fred Wang, Gen. Del.	Pierson	MB ROM 1SO	172138	All	
R.R. 2	Buffalo Lake	MB ROM 1SO	169767 U	1/9	I
2410 Red Leaf Court	Windom	MN 55314	169767 U	1/9	I
Route 2, P.O. Box 245	Hector	MN 56101	169767 U	1/9	I
Route 2, P.O. Box 245	Hector	MN 55342	169767 U	1/9	I
Box 200, Station "N"	Calgary	MN 55342	178183 U	2/3	I
Box 200, Station "N"	Calgary	AB T2P 2H8			
29 Langley Street	Regina	AB T2P 2H8			
ebary	Regina	SK S4S 3V5	27114	All	
Box 35	Pierson	MB ROM 1LO	38056	All	
29 Langley Street	Regina	SK S4S 3V5	27114	All	
ebary					
on Army, Canada West					
	Winnipeg	MB R3C 3H8	59038	All	
			59038	All	
			59038	All	
			59038	All	

October 1, 1991



Chairman  
 The Oil and Natural Gas Conservation Board  
 Department of Energy and Mines  
 Petroleum Branch  
 555 - 330 Graham Ave.  
 Winnipeg, MB  
 R3C 4A5

Dear Sir:

Re: Board Order No. SU6

Tundra Oil and Gas Ltd. hereby applies to have the special drilling spacing units established by the above Board Order extended past the expiry date of October 31, 1991, pursuant to Section 20 of the Petroleum Drilling and Production Regulations.

Production results in developing our lands in the Pierson Lower Amaranth B Pool have been disappointing to date, falling short of our expectations as outlined in our April 3, 1990 Special Drilling Spacing Unit Application. We have revised our production expectations accordingly.

	16 ha	32 ha
IP (BOPD)	18	18
Decline in year 1	-50%	-50%
Decline/year thereafter	-15%	-10%
Recoverable Reserves (Bbls.)	20,270	30,934

Economic analyses were performed using current oil price (\$21.00/Bbl.) and the results are summarized as follows (copies attached):

	16 ha	32 ha
After Tax NPV @ 20% (M\$)	-44	-24
After Tax Rate of Return (%)	7.9	15.0

Neither well would have acceptable economics under current prices. The 16 ha spacing would result in approximately 31% more reserve recovery per unit area but is much less economic due to overcapitalization.

Chairman / The Oil and Natural Gas Conservation Board  
October 1, 1991  
Page 2

Given that an oil price increase is needed to justify further development of these lands, the economic analysis was re-run with higher oil price (\$25.00/Bbl.) expectations. The results are summarized as follows (copies attached):

	<u>16 ha</u>	<u>32 ha</u>
After Tax NPV @ 20% (M\$)	-12	8
After Tax Rate of Return (%)	16.8	21.7

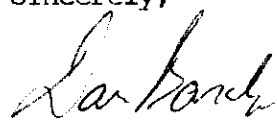
At these price levels, the 32 ha spacing attains satisfactory economics, while 16 ha spacing is still unattractive.

It is our position that, given that an oil price in excess of \$25.00/Bbl. in the near future is improbable, the only way in which these lands could become economic to develop is to continue to currently designated 32 ha spacing in the Pool.

Pursuant to your letter of July 31, 1990, granting 32 ha spacing, enclosed are the results of a pressure survey conducted at Tundra Pierson Prov. 4-22-2-29 WPM.

If you have any questions regarding the above, don't hesitate to call.

Sincerely,



Dan Barchyn, P. Eng.  
Exploration Manager

DB/ck

Attachments

September 30, 1991

Chairman  
The Oil and Natural Gas Conservation Board  
Department of Energy and Mines  
Petroleum Branch  
555 - 330 Graham Ave.  
Winnipeg, MB  
R3C 4A5

Dear Sir:

Re: Board Order No. SU6

Tundra Oil and Gas Ltd. hereby applies to have the special drilling spacing units established by the above Board Order extended past the expiry date of October 31, 1991, pursuant to Section 20 of the Petroleum Drilling and Production Regulations.

~~Our~~ Production results in developing our lands in the Pierson Lower Amaranth B Pool have been disappointing to date, falling short of our expectations as outlined in our April 3, 1990 Special Drilling Spacing Unit Application. We have revised our production *expectations* accordingly.

	16 ha	32 ha
IP (BOPD)	18	18
Decline in year 1	-50%	-50%
Decline/year thereafter	-15%	-10%
Recoverable Reserves (Bbls.)	20,270	30,934

Economic analyses were performed using current oil prices (\$21.00/Bbl.) ~~expectations~~ and the results are summarized as follows (copies attached):

	16 ha	32 ha
After Tax NPV @ 20% (M\$)	-44	-24
After Tax Rate of Return (%)	7.9	15.0

*have acceptable*  
Neither well would ~~be~~ economic under current prices. The 16 ha spacing would result in approximately 31% more reserve recovery per unit area but is much less economic due to overcapitalization.

Given that an oil price increase is needed to justify further development of these lands, the economic analysis ~~is~~ *was* re-run with

Chairman / The Oil and Natural Gas Conservation Board  
September 30, 1991  
Page 2

higher oil price (~~25.00~~<sup>25.00</sup>/Bbl.) expectations. The results are summarized as follows (copies attached):

	16 ha	32 ha
After Tax NPV @ 20% (M\$)	-12	8
After Tax Rate of Return (%)	16.8	21.7

At these price levels, the 32 ha spacing <sup>attains satisfactory</sup> ~~becomes~~ economic, while 16 ha spacing is still ~~uneconomic~~ <sup>unattractive</sup>.

It is our position~~x~~ that, given that an oil price in excess of \$25.00/Bbl. in the near future is improbable, the only way in which these lands could become economic to develop is to continue to currently designated 32 ha spacing in the Pool.

Pursuant to your letter of July 31, 1990, granting 32 ha spacing, enclosed are the results of a pressure survey conducted at Tundra Pierson Prov. 4-22-2-29 WPM.

If you have any questions regarding the above, don't hesitate to call.

Sincerely,

Dan Barchyn, P. Eng.  
Exploration Manager

DB/ck

Attachments

----- CASE DESCRIPTION -----  
DRILLING ECONOMICS 6-22-2-29  
16 HA SPACING

# 21.00 oil

Royalty Regime: MANITOBA Gas Holiday: NO  
Reserve type: Prov Devel Oil Holiday: NO  
Royalty Type: Crown Eval/Prod Start: 91- 1/91- 1  
Sensitivity: NO Proj/Econ Life: 10.6/10.0 yrs

DISC RATE (%)	NET PRESENT VALUES (M\$)					
	0.0	12.0	15.0	20.0	22.0	24.0
B.T. OPER INC	245	181	170	154	148	143
B.T. CAP INV.	195	195	195	195	195	195
B.T. CASH FLOW	50	-14	-25	-41	-47	-52
A.T. OPER INC	298	178	167	151	146	141
A.T. CAP INV.	195	195	195	195	195	195
A.T. CASH FLOW	43	-17	-28	-44	-49	-54

ECONOMIC INDICATORS				PRODUCTS RECOVERY				COMPANY W.I.			
		B.TAX	A.TAX		GROSS	WI	ROY	NET	Init%	Avr%	Rev%
ROR	- PCNT	8.8	7.9	OIL	STB	20270	461	19809	100.0	100.0	
PAYOUT PERIOD	- EVAL	4.9	4.9	GAS-RAW	MSCF	0	0		100.0	0.0	
	- CAPTL	4.9	4.9	GAS-SALES	MSCF	0	0	0			
UNDISC PIR	- \$/\$	0.26	0.22	ETHANE	STB	0	0	0			
15.0 PCT PIR	- \$/\$	-0.13	-0.14	PROPANE	STB	0	0	0			
22.0 PCT PIR	- \$/\$	-0.24	-0.25	BUTANE	STB	0	0	0			
NPV @ 15.0	- \$/Bbl	-1.24	-1.39	CONDENS.	STB	0	0	0			
NPV @ 22.0	- \$/Bbl	-2.32	-2.43	SULPHUR	LT	0	0	0			
				OTHER	STB	0	0	0			
									ROYALTY	0.0	2.4

WI CASH FLOW SUMMARY												AFTER TAX			
YEAR	OIL PRODUCTION	TOTAL	ROYALTY	OPERATING	OPER	NETBACK	CAPTL	B.TAX	TOTAL	-----	-----	CASH	15.0%	CUM	
	RATE VOL. PRICE	REV.	%INTAX	EXPENSE	INC.	B.TAX	INV.	CASH	TAX	CASH	15.0%	CUM			
	Bbl/D STB \$/Bbl	\$	\$ %	\$ \$/Bbl	\$	\$/Bbl	\$	\$	\$	\$	\$	\$	\$	\$	\$
ZERO							195000	-195000	0	-195000	-195000	-195000			
1991	13 4739 21.00	99524	0	0 25350 5.35	74174	15.65	0	74174	2939	71235	66119	-128881			
1992	8 3032 21.00	63671	0	0 21817 7.20	41854	13.80	0	41854	-3435	45288	36214	-92668			
1993	7 2577 22.05	56826	1214	2 21566 8.37	34047	13.21	0	34047	-529	34570	23815	-68852			
1994	6 2191 23.15	50718	2906	6 21446 9.79	26366	12.04	0	26366	1085	25281	15004	-53848			
1995	5 1862 24.31	45265	2205	5 21449 11.52	21612	11.61	0	21612	1808	19804	10126	-43729			
1996	4 1583 25.53	40399	1673	4 21566 13.63	17160	10.84	0	17160	1937	15229	6706	-37017			
1997	4 1345 26.80	36056	1269	4 21793 16.20	12995	9.66	0	12995	1674	11321	4296	-32721			
1998	3 1142 28.14	32151	962	3 22100 19.34	9088	7.96	0	9088	1154	7934	2594	-30127			
1999	3 972 29.55	28726	730	3 22550 23.20	5445	5.60	0	5445	482	4963	1398	-28729			
2000	2 826 31.03	25638	554	2 23072 27.92	2011	2.43	0	2011	-289	2301	558	-28171			
SUBT	20270	478975	11513	222710	244752		195000	49752	6832	42921	-28171				
REM.	0	0	0	0	0		0	0	0	0	0				
TOTL	20270	478975	11513	222710	244752		195000	49752	6832	42921	-28171				
15.0% DISC		291980	5561	116470	169949		195000	-25051	3121	-28171					
% OF REV.		100	2	40	58		67	-9	1	-10					

----- CASE DESCRIPTION -----

DRILLING ECONOMICS 6-22-2-29  
32 HA SPACING

\$21.00 oil

Royalty Regime: MANITOBA Gas Holiday: NO  
Reserve type: Prov Devel Oil Holiday: NO  
Royalty Type: Crown Eval/Prod Start: 91- 1/91- 1  
Sensitivity: NO Proj/Econ Life: 16.6/16.0 yrs

----- NET PRESENT VALUES (M\$) -----  
DISC RATE (%) 0.0 12.0 15.0 20.0 22.0 24.0

B.T. OPER INC	386	237	215	186	177	168
B.T. CAP INV.	195	195	195	195	195	195
B.T. CASH FLOW	191	42	20	-9	-18	-27
A.T. OPER INC	328	213	195	171	164	156
A.T. CAP INV.	195	195	195	195	195	195
A.T. CASH FLOW	133	18	0	-24	-31	-39

----- ECONOMIC INDICATORS -----

		B. TAX	A. TAX
ROR	- PCNT	18.3	15.0
PAYOUT PERIOD	- EVAL	4.2	4.4
	- CAPTL	4.2	4.4
UNDISC PIR	- \$/\$	0.98	0.68
15.0 PCT PIR	- \$/\$	0.10	0.00
22.0 PCT PIR	- \$/\$	-0.09	-0.16
NPV @ 15.0	- \$/Bbl	0.65	0.00
NPV @ 22.0	- \$/Bbl	-0.59	-1.02

----- PRODUCTS RECOVERY -----

		GROSS	WI	ROY	NET
OIL	STB	30934	30934	1029	29904
GAS-RAW	MSCF	0	0		
GAS-SALES	MSCF	0	0	0	0
ETHANE	STB	0	0	0	0
PROPANE	STB	0	0	0	0
BUTANE	STB	0	0	0	0
CONDENS.	STB	0	0	0	0
SULPHUR	LT	0	0	0	0
OTHER	STB	0	0	0	0

----- COMPANY W.I. -----

	Init%	Avr%	Rev%
REVENUE	100.0	100.0	
FIELD CAP	100.0	0.0	
PLANT CAP			
GATH CAP			
ORR-GAS			
ORR-OIL			
ROYALTY	0.0	3.4	

----- WI CASH FLOW SUMMARY -----

YEAR	OIL RATE Bbl/D	PRODUCTION VOL. STB	PRICE \$/Bbl	TOTAL REV. \$	ROYALTY \$	OPERATING EXPENSE \$/Bbl	OPER INC. \$	NETBACK \$/Bbl	CAPTL INV. \$	B. TAX CASH \$	TOTAL TAX \$	AFTER TAX CASH \$	15.0% \$	CUM \$
ZERO									195000	-195000	0	-195000	-195000	-195000
1991	13	4739	21.00	99524	0	25350	5.35	74174	15.65	0	74174	2939	71235	66119 -128881
1992	9	3118	21.00	65475	0	22059	7.08	43416	13.92	0	43416	-2897	46314	37034 -91848
1993	8	2806	22.05	61874	1831	22241	7.93	37802	13.47	0	37802	980	36822	25366 -66481
1994	7	2626	23.15	60791	4175	22794	8.68	33821	12.88	0	33821	4084	29737	17648 -48833
1995	7	2459	24.31	59779	3845	23392	9.51	32542	13.23	0	32542	6129	26412	13504 -35329
1996	6	2213	25.53	56491	3270	23721	10.72	29500	13.33	0	29500	6729	22771	10030 -25298
1997	5	1992	26.80	53384	2781	24113	12.11	26490	13.30	0	26490	6833	19656	7459 -17839
1998	5	1793	28.14	50448	2366	24568	13.71	23514	13.12	0	23514	6596	16918	5531 -12308
1999	4	1613	29.55	47673	2012	25087	15.55	20574	12.75	0	20574	6124	14450	4070 -8239
2000	4	1452	31.03	45051	1711	25671	17.68	17668	12.17	0	17668	5491	12177	2955 -5284
2001	4	1307	32.58	42573	1455	26322	20.14	14796	11.32	0	14796	4751	10046	2100 -3184
2002	3	1176	34.21	40232	1238	27039	22.99	11955	10.16	0	11955	3937	8018	1444 -1740
2003	3	1059	35.92	38019	1053	27826	26.29	9141	8.64	0	9141	3076	6065	941 -799
2004	3	953	37.71	35928	895	28682	30.11	6350	6.67	0	6350	2184	4166	557 -242
2005	2	857	39.60	33952	761	29611	34.54	3579	4.17	0	3579	1272	2307	266 23
SUBT		30162		791192	27395	378476		385321		195000	190321	58228	132093	23
REM.		772		32084	648	30615		822		0	822	347	475	47
TOTL		30934		823277	28042	409091		386143		195000	191143	58576	132568	70
15.0% DISC % OF REV.				373929	10919	147873		215137		195000	20137	20067	70	
				100	3	40		58		52	5	5	0	



----- CASE DESCRIPTION -----

DRILLING ECONOMICS 6-22-2-29  
16 HA SPACING

#25.00

Royalty Regime: MANITOBA Gas Holiday: NO  
Reserve type: Prov Devel Oil Holiday: NO  
Royalty Type: Crown Eval/Prod Start: 91- 1/91- 1  
Sensitivity: NO Proj/Econ Life: 10.6/10.6 yrs

----- NET PRESENT VALUES (M\$) -----

DISC RATE (%)	0.0	12.0	15.0	20.0	22.0	24.0
B.T. OPER INC	336	241	225	202	194	186
B.T. CAP INV.	195	195	195	195	195	195
B.T. CASH FLOW	141	46	30	7	-1	-9
A.T. OPER INC	298	217	203	183	176	169
A.T. CAP INV.	195	195	195	195	195	195
A.T. CASH FLOW	103	22	8	-12	-19	-26

----- ECONOMIC INDICATORS -----

		B.TAX	A.TAX
ROR	- PCNT	21.7	16.8
PAYOUT PERIOD	- EVAL	3.1	3.5
	- CAPTL	3.1	3.5
UNDISC PIR	- \$/\$	0.72	0.53
15.0 PCT PIR	- \$/\$	0.15	0.04
22.0 PCT PIR	- \$/\$	-0.01	-0.10
NPV @ 15.0	- \$/Bbl	1.45	0.37
NPV @ 22.0	- \$/Bbl	-0.05	-0.94

----- PRODUCTS RECOVERY -----

		GROSS	WI	ROY	NET
		20712	20712	473	20239
OIL	STB	0	0		
GAS-RAW	MSCF	0	0		
GAS-SALES	MSCF	0	0	0	0
ETHANE	STB	0	0	0	0
PROPANE	STB	0	0	0	0
BUTANE	STB	0	0	0	0
CONDENS.	STB	0	0	0	0
SULPHUR	LT	0	0	0	0
OTHER	STB	0	0	0	0

----- COMPANY W.I. -----

	Init%	Avr%	Rev%
REVENUE	100.0	100.0	
FIELD CAP	100.0	0.0	
PLANT CAP			
GATH CAP			
ORR-GAS			
ORR-OIL			
ROYALTY	0.0	2.4	

----- WI CASH FLOW SUMMARY -----

YEAR	OIL PRODUCTION	TOTAL	ROYALTY	OPERATING	OPER	NETBACK	CAPTL	B.TAX	TOTAL	AFTER TAX	15.0%	CUM
	RATE	VOL.	PRICE	REV.	EXPENSE	INC.	INV.	CASH	TAX	CASH		
	Bbl/D	STB	\$/Bbl	\$	\$	\$/Bbl	\$	\$	\$	\$	\$	\$
ZERO							195000	-195000	0	-195000	-195000	-195000
1991	13	4739	25.00	118481	0	0	93131	19.65	0	93131	9457	83675
1992	8	3032	25.00	75799	0	0	53981	17.80	0	53981	735	53247
1993	7	2577	26.25	67650	1456	2	44628	17.32	0	44628	3198	41480
1994	6	2191	27.56	60378	3488	6	35444	16.18	0	35444	4406	31039
1995	5	1862	28.94	53887	2646	5	29793	16.00	0	29793	4772	25021
1996	4	1583	30.39	48095	2007	4	24521	15.49	0	24521	4583	19938
1997	4	1345	31.91	42924	1529	4	19609	14.58	0	19609	4035	15574
1998	3	1142	33.50	38274	1154	3	15020	13.15	0	15020	3260	11760
1999	3	972	35.18	34197	877	3	10770	11.08	0	10770	2363	8407
2000	2	826	36.94	30521	665	2	6784	8.21	0	6784	1390	5394
2001	2	443	38.78	17162	328	2	2308	5.21	0	2308	69	2238
SUBT		20712		587370	14144		335989		195000	140989	38267	102722
REM.		0		0	0		0		0	0	0	0
TOTL		20712		587370	14144		335989		195000	140989	38267	102722
15.0% DISC				351183	6742		224934		195000	29934	22256	7678
% OF REV.				100	2		64		56	9	6	2

32. ~~HA~~ SPACING  
\$25.00 / Dbl

----- CASE DESCRIPTION -----  
DRILLING ECONOMICS 6-22-2-29

----- NET PRESENT VALUES (M\$) -----  
DISC RATE (%) 0.0 12.0 15.0 20.0 22.0 24.0

B.T. OPER INC 497 300 272 235 223 212  
B.T. CAP INV. 195 195 195 195 195 195  
B.T. CASH FLOW 302 105 77 40 28 17

A.T. OPER INC 400 254 232 203 194 185  
A.T. CAP INV. 195 195 195 195 195 195  
A.T. CASH FLOW 205 59 37 8 -1 -10

Royalty Regime: MANITOBA Gas Holiday: NO  
Reserve type: Prov Devel Oil Holiday: NO  
Royalty Type: Crown Eval/Prod Start: 91- 1/91- 1  
Sensitivity: NO Proj/Econ Life: 16.2/16.2 yrs

----- ECONOMIC INDICATORS -----

----- PRODUCTS RECOVERY -----

----- COMPANY W.I. -----

		B. TAX	A. TAX			GROSS	WI	ROY	NET			Init%	Avr%	Rev%
ROR	- PCNT	27.6	21.7	OIL	STB	29378	29378	910	28468	REVENUE	100.0	100.0		
PAYOUT PERIOD	- EVAL	2.9	3.4	GAS-RAW	MSCF	0	0			FIELD CAP	100.0	0.0		
	- CAPTL	2.9	3.4	GAS-SALES	MSCF	0	0	0	0	PLANT CAP				
UNDISC PIR	- \$/\$	1.55	1.05	ETHANE	STB	0	0	0	0	GATH CAP				
15.0 PCT PIR	- \$/\$	0.39	0.19	PROPANE	STB	0	0	0	0					
22.0 PCT PIR	- \$/\$	0.14	-0.01	BUTANE	STB	0	0	0	0	ORR-GAS				
NPV @ 15.0	- \$/Bbl	2.61	1.26	CONDENS.	STB	0	0	0	0	ORR-OIL				
NPV @ 22.0	- \$/Bbl	0.95	-0.05	SULPHUR	LT	0	0	0	0					
				OTHER	STB	0	0	0	0	ROYALTY	0.0	3.2		

----- WI CASH FLOW SUMMARY -----

YEAR	OIL PRODUCTION			TOTAL	ROYALTY		OPERATING		OPER	NETBACK	CAPTL	B. TAX	TOTAL	AFTER TAX		
	RATE	VOL.	PRICE	REV.	\$MINTAX	%	EXPENSE	INC.	B. TAX	INV.	CASH	TAX	CASH	15.0%	CUM	
	Bbl/D	STB	\$/Bbl	\$	\$	%	\$/Bbl	\$	\$/Bbl	\$	\$	\$	\$	\$	\$	
ZERO											195000	-195000	0	-195000	-195000	
1991	13	4739	25.00	118481	0	0	25350	5.35	93131	19.65	0	93131	9457	89675	77665	
1992	9	3118	25.00	77947	0	0	22059	7.08	55888	17.92	0	55888	1390	54497	43578	
1993	8	2806	26.25	73660	2197	3	22241	7.93	49221	17.54	0	49221	5032	44189	30441	
1994	7	2525	27.56	69608	4636	7	22484	8.90	42489	16.82	0	42489	7222	35266	20930	
1995	6	2273	28.94	65780	3943	6	22786	10.02	39051	17.18	0	39051	8401	30650	15671	
1996	6	2046	30.39	62162	3353	5	23148	11.32	35660	17.43	0	35660	8875	26785	11798	
1997	5	1841	31.91	58743	2852	5	23572	12.80	32319	17.55	0	32319	8862	23457	8902	
1998	5	1655	33.50	55459	2429	4	24033	14.52	29003	17.52	0	29003	8503	20500	6702	
1999	4	1491	35.18	52465	2063	4	24605	16.50	25796	17.80	0	25796	7937	17859	5030	
2000	4	1342	36.94	49579	1755	4	25216	18.79	22609	16.84	0	22609	7205	15404	3738	
2001	3	753	38.78	29204	949	3	15881	21.09	12373	16.43	0	12373	3744	8630	1804	
2002	3	1133	40.72	46128	1378	3	26841	23.69	17910	15.81	0	17910	6033	11877	2139	
2003	3	1019	42.76	43591	1172	3	27638	27.11	14782	14.50	0	14782	5056	9725	1509	
2004	3	918	44.90	41194	997	2	28505	31.07	11692	12.74	0	11692	4055	7637	1021	
2005	2	826	47.14	38928	848	2	29444	35.66	8637	10.46	0	8637	3040	5596	644	
SUBT		28486		882929	28567		363802		490560		195000	295560	94813	200748	36571	
REN.		892		44515	863		37222		6430		0	6430	2235	4195	408	
TOTL		29378		927444	29430		401024		496990		195000	301990	97048	204942	36979	
15.0% DISC				428071	11589		144772		271716		195000	76716	39737	36979		
% OF REV.				100	3		34		63		46	18	9	9		

MEMORANDUM

TO: BOB PUCHNIAK/WELLFILE  
FROM: DEREK LONGFIELD  
DATE: FEBRUARY 22, 1991  
SUBJECT: SURFACE PRESSURE BUILDUP SURVEY  
TOGL SOUTH PIERSON 4-22-2-29 WIM

---

As requested, I have completed a very cursory analysis of the subject buildup survey. While not completely definitive, the data strongly suggests the following:

- 1) The entire buildup is dominated by linear flow. This may either be representative of hydraulic fracture flow from a very tight reservoir, linear flow from the penetration of a long, narrow reservoir, or a small lenticular higher permeability porous zone sandwiched in tighter rock, which is feeding the permeable rock. Given the producing character of the well, the second postulation is most likely.
- 2) If original pressure was in the 1200 psi range, this zone has undergone substantial effective depletion in its first 10 months of production. While the nature of the Horner Plot (increasing upward curvature with time) would indicate the well may return to original pressure, it would take over a year for the well to reach even 700 or 800 psi.
- 3) Further shut-in time will not yield any more conclusive data from the survey.

Please advise if you require a more detailed analysis.

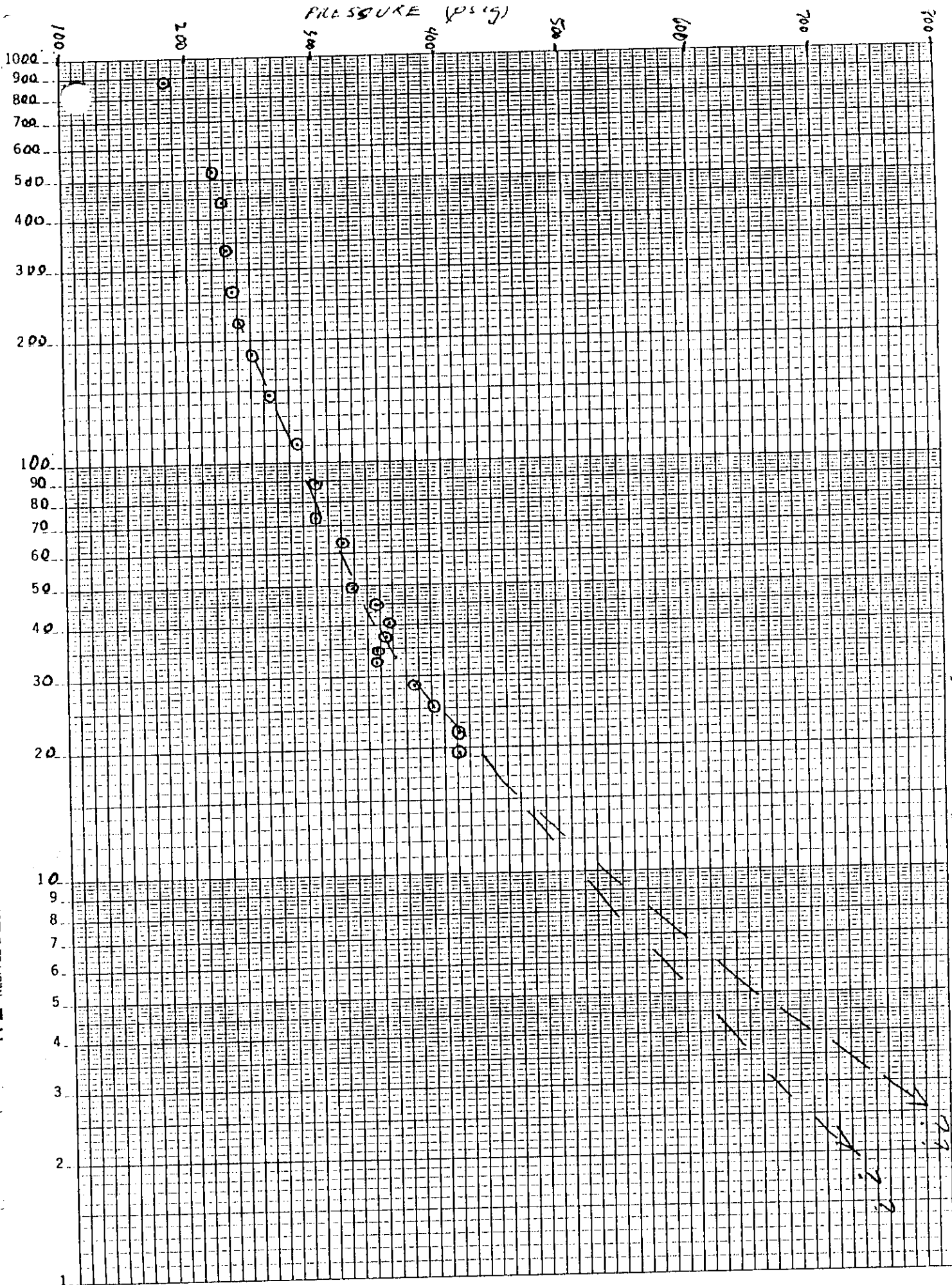


Derek Longfield

FILE 5500 (P. 19)

46 5490

K-E SEMI-LOGARITHMIC 3 CYCLES X 70 DIVISIONS  
KEUFFEL & ESSER CO. MADE IN U.S.A.



MEASURE BUILDUP SURVEY  
4-22-2-29 W.M.

# Home Oil Company Limited

1600 Home Oil Tower  
324 Eighth Avenue S.W.  
Calgary, Alberta T2P 2Z5  
Telephone (403) 232-7100  
Fax (403) 232-7678



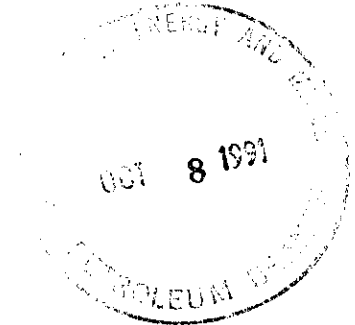
September 26, 1991

Manitoba Energy and Mines  
Petroleum Branch  
# 555, 330 Graham Avenue  
Winnipeg, Manitoba  
R3C 4E3

Attention: Mr. L.R. Dubreuil, P. Eng.  
Director, Petroleum Branch

Dear Mr. Dubreuil:

RE: South Pierson Field  
Application for Special Drilling Spacing Units and  
Maximum Permissible Production Rate



As you are aware, temporary approvals of special spacing and MPR for production of oil from the Lower Amaranth Spearfish formation in a part of the South Pierson field expire October 31, 1991. Further, per your discussions with our staff, Home Oil Company Limited, as Operator of the above mentioned lands, believes that the special spacing and MPR currently in place is optimum for development of the field during primary depletion from the standpoints of conservation and prudent depletion planning.

Therefore, Home Oil hereby applies under the Petroleum Drilling and Production Regulation Section 20 for permanent designation of special drilling spacing units in the South Pierson field; and applies under Section 51 of the Petroleum Drilling and Production Regulation for an amendment in the maximum permissible production rate. These applications are for the production of crude oil from the Lower Amaranth and Mission Canyon formations.

The following information is provided in accordance with the regulations:

1. The area of application is shown in Attachment 1. A list of mineral owners within one-half kilometre of the application area will be forwarded as soon as it is available.
2. Within the area of application, drilling spacing units of 32 hectares comprising LSD's 1 and 8, 2 and 7, 3 and 6, etc. are requested with the target area being within the even numbered LSD's. Central targets as specified in Part IV Section 21(1) of the Petroleum Drilling and Production Regulation are requested. It is further requested that any wells drilled within the area of application on pre-existing spacing (16 ha) be deemed on target under the approval.

Pursuant to Section 115, this application is based on the ability of the wells within the application area to adequately drain 32 hectares within a reasonable time frame. Attachment 2 is a discussion of the results of a three dimensional numerical simulation of the Lower Amaranth formation which supports this contention. Ongoing interaction between the Lower Amaranth and Mission Canyon identified during the study warrants the consistent treatment of spacing for the two zones.

3. Within the area of application, a maximum permissible production rate (MPR) of  $360 \text{ m}^3$  /month and  $14 \text{ m}^3$  /day per well is requested. Attachment 3 provides justification for this increase in MPR.

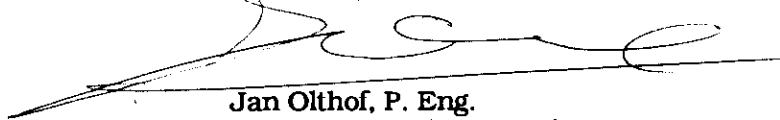
The correlative rights of the offset mineral owners will not be adversely affected by this proposal. By enlarging the drilling spacing units, the well density within the application area is reduced. The withdrawal rate per unit reservoir volume will be equal to or less than would occur on 16 ha spacing since the majority of the wells are not capable of producing at double the 16 ha MPR.

As was discussed with you in August, Home Oil staff have determined that there is some measure of ongoing interaction between the Lower Amaranth and underlying Mission Canyon formations. This unforeseen complexity has delayed Home Oil's ability to provide you with the requested waterflood feasibility study. We are currently working to identify a course of action which will allow us to provide you with our proposal for optimum depletion of the pool. The action plan will be made available to you in the month of October, 1991 and will be designed to provide the required answers within a one year time frame. This will allow adequate time for waterflood implementation, if feasible, as we estimate the more mature areas of the field to be 2.5 to 3 years away from reaching bubblepoint pressure at the anticipated rate of depletion.

Finally, Home Oil is aware that processing of this application may not be possible by October 31st. To that end we request that the current temporary approvals for both spacing units and MPR be extended until a decision is made with respect to this application.

We trust this proposal will meet with your approval. Your earliest consideration of these applications would be greatly appreciated. Should you have any questions, please contact Mr. Dave Bertram, P.Eng. at (403)232-7702.

Yours very truly,



Jan Olthof, P. Eng.  
Manager, Southern Production

cc: Day File  
G.C.K. Johnson  
TIC - Man. - S. Pierson

## ATTACHMENT 2

### SPECIAL DRILLING SPACING UNITS

As requested in your October 5, 1989 letter approving Home Oil's 32 ha spacing application for a two (2) year period ending October 31, 1991, Home Oil has undertaken the task of evaluating the performance of the Lower Amaranth formation. A three dimensional numerical simulation model was developed using Petresim Engineering's Desktop VIP Black Oil numerical simulation package. The initial purpose of this model was to evaluate the level of incremental recovery associated with reducing spacing to 16 hectares and to evaluate the feasibility of waterflooding the Lower Amaranth formation. As will be illustrated, these objectives have been partially met.

Figure 1 illustrates the area chosen for the simulation. 7 wells and 128 ha of land are contained within this area; 3 wells drilled prior to 1988 with the remaining four wells drilled in the spring of 1990. This area was chosen because it contained the discovery well; 16-08, which has almost 6 years of history and 2 wells; 12-09 and 14-09 with more than four years of history. In addition, this area has been almost fully drilled on 32 ha spacing and therefore reduced spacing could be addressed adequately.

The model was constructed using a 20 X 20 grid with three layers. Core data was the major basis for assigning net pay, porosity, and permeability values for each layer in the study area. Structure, net pay, porosity and permeability maps were digitized for input into the model.

Using the oil base core data from well 12-19-002-29 W1M, a gas-oil relative permeability curve was developed. The curve has an irreducible water saturation of 41 %, residual oil saturation of 40 %, and a critical gas saturation of 2 %.

A reservoir fluid study conducted on a fluid sample from 06-19-002-29 W1M in 1987 was used as PVT input for the model. Water and rock compressibilities used in the study were  $4.7 \times 10^{-7} \text{ kPa}^{-1}$  and  $5.8 \times 10^{-7} \text{ kPa}^{-1}$ , respectively. The data used in the study closely resembled that used in Waskada Lower Amaranth Pool Model Study which was conducted by Omega Hydrocarbons.

Attempting to validate or history match the model proved to be difficult and ultimately provided new insight into the drive mechanism (refer to Figure 2). The simulator showed that depletion of the Spearfish reservoir, when treated volumetrically, from the initial pressure of 10,500 kPa to the bubble point pressure (4,550 kPa) should have occurred by mid 1990 based on the historical production. Home Oil's annual pressure surveys indicate the current reservoir pressure to be in the order of 9,000 kPa and GOR performance indicates the pool is still undersaturated.

Variations were made to the model porosity and permeability parameters in an attempt to match the model to oil production and pressure history. Even doubling porosity or increasing average permeability 100-fold resulted in early pressure depletion to the bubble point around the wellbores with a large increase in the producing GOR of the wells. This phenomena has not been observed to date in the field, and the slow decline in reservoir pressure and production rate is the major difference between the performance of the S. Pierson and Waskada fields.

It is Home's belief that limited repressuring of the Lower Amaranth formation is occurring from the Mission Canyon formation. This pressure support occurs via either fractures created by the hydraulic fracture treatments or extensive in-situ fracturing of the Mission Canyon and overlying anhydritic dolomite. Fractures of the Mission Canyon have been observed in core but it is not known if these fractures are pervasive.

Under this type of drive mechanism, with the Lower Amaranth and Mission Canyon formations in communication, it is Home's opinion that they cannot be distinguished as separate formations. It is for this reason that Home makes application for 32 ha spacing for both formations in the application area.

Decline analysis indicates that a recovery factor of between 10 to 12 % is realistic and achievable on 32 ha spacing. This recovery factor is consistent with similar pools on 16 ha spacing in the area. Cumulative recovery to date for the wells in the simulation area ranges from 1.5 % to 6.5 % OOIP.

Development of the pool on 16 ha spacing at this time would expedite the pressure depletion. Extrapolation of the pressure depletion versus reservoir withdrawals leads Home to conclude that the bubble point pressure will not be attained for approximately 3 more years. Doubling the well count would cause a more rapid decline in the pressure and would not allow sufficient time to design and implement an appropriate enhanced recovery scheme.

As indicated in the covering letter, Home Oil is reviewing the feasibility of waterflooding the Lower Amaranth. As part of the waterflood evaluation, well spacing will be investigated to explore its' effect on flood efficiency.



FIGURE 1

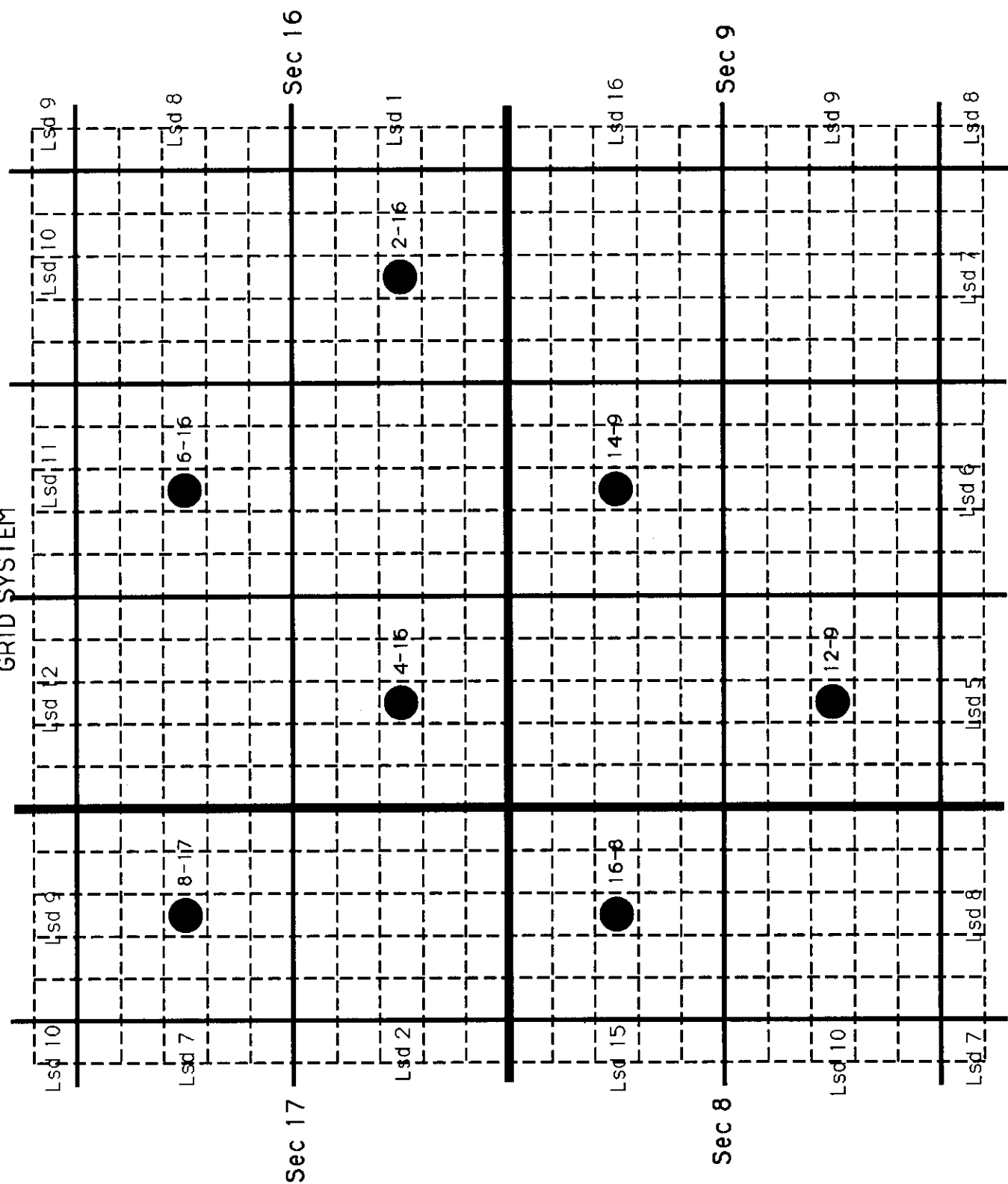
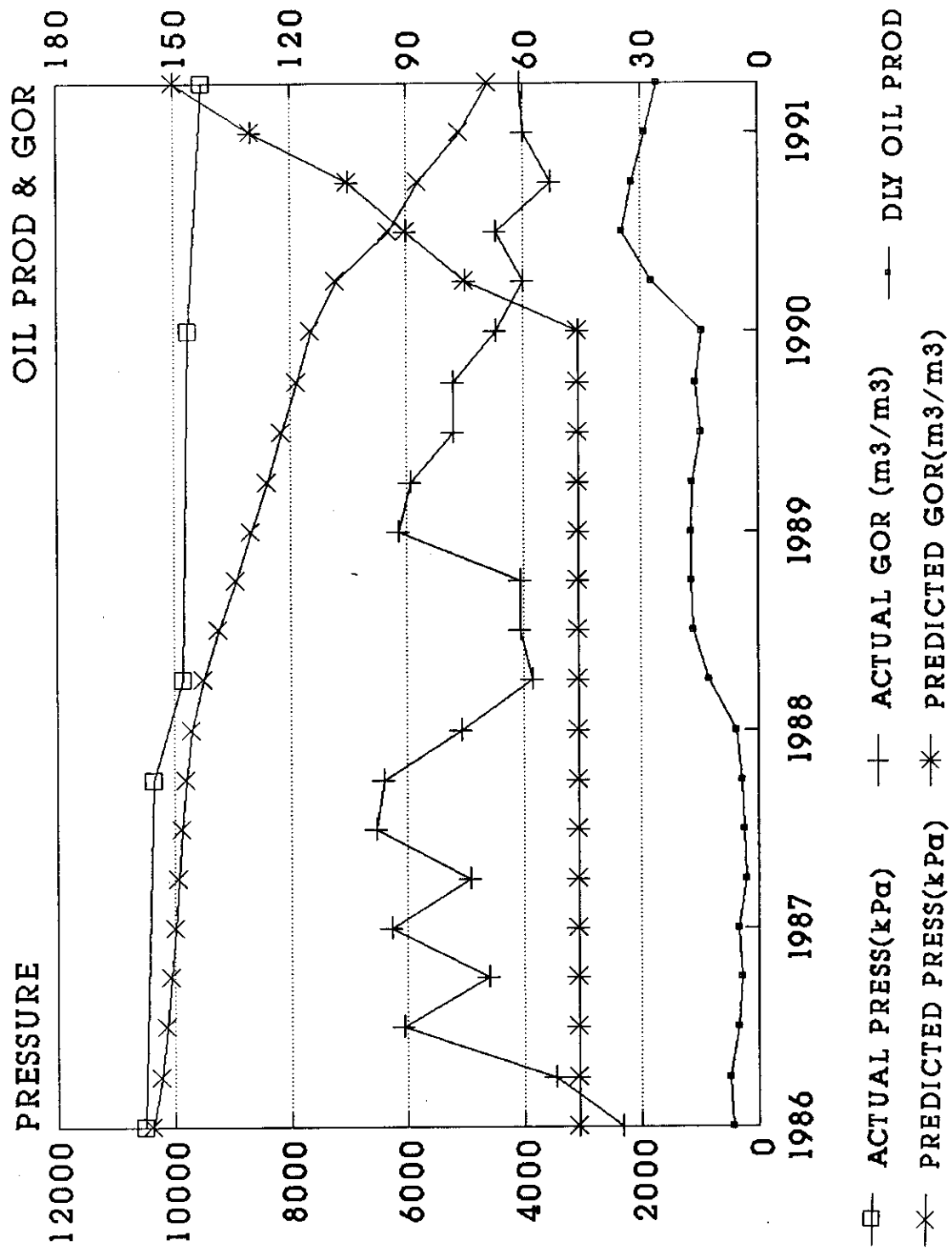


Figure 2  
SOUTH PIERSON



### ATTACHMENT 3

#### MAXIMUM PERMISSIBLE PRODUCTION RATE

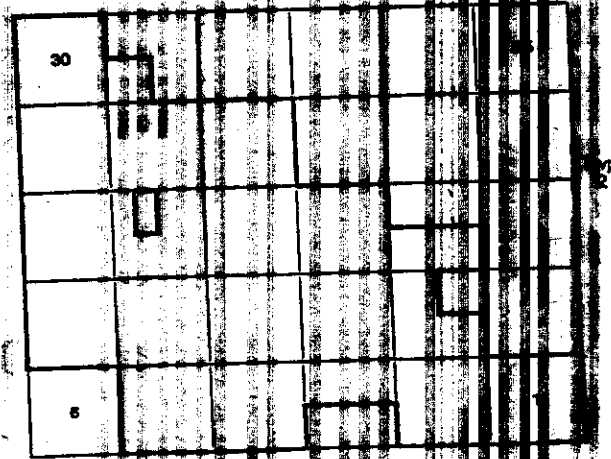
It is Home Oil's belief that increasing the MPR for the South Pierson field will not deter from attaining our mutual objective of maximizing oil recovery in South Pierson. The increase in the MPR enhances the short term economics for Home Oil but most wells are not able to sustain these elevated rates for any significant length of time. Production history has indicated rapid decline in the early life of the South Pierson wells with rates stabilizing at less than the regulation established MPR of 8 m<sup>3</sup> /day. At the present time, only one well (16-09-002-29 W1M) is capable of producing in excess of 8 m<sup>3</sup> /day. Reservoir pressure decline in South Pierson has been minimal to date as indicated by the annual pressure surveys. Therefore, Home Oil believes an increase in the maximum permissible production rate will not promote a further significant decline in the reservoir pressure. With respect to drainage, Home contends that the short term nature of production at elevated rates does not result in unfair drainage of off-setting DSU's. Long term performance of wells in the field is remarkably consistent (3.5 m<sup>3</sup> /d average production) and drainage patterns are unaffected by the MPR increase.

# NOTICE—UNDER THE NEW ACT

Home Oil Company Limited has submitted an application under section 11(1) of the Petroleum Drilling and Production Regulations for an increase in the maximum permissible production rate for wells producing from the Lower Annapolis Formation located in the area of application outlined below.

It is proposed that the maximum permissible production rate for the wells in the area of application be increased from 9.5 m³ of clean oil per day and 200 m³ of clean oil per month to 14 m³ of clean oil per day and 300 m³ of clean oil per month.

## SOUTH PERSON AREA



Scale 200 m

Area of application

If no objection is written and received by the Board at Room 309 Legislative Building, Winnipeg, Manitoba, R3C 0V6 before January 12, 1991, the Board may approve the application.

Copies of the application may be obtained from:

M. A. Walsh  
Home Oil Company Limited  
100 Home Oil Tower  
1350 Graham Avenue S.W.  
Calgary, Alberta T2L 2Z1 (403) 227-7442

The application may be viewed at the offices of the Petroleum Branch:

215301 Graham Avenue  
Winnipeg, Manitoba  
(204) 945-6571

Winnipeg, Manitoba  
(204) 633-2441

Date of filing: this 12th day of December 1990

21 Gary Meyer, Deputy Chairman



The Oil and Natural Gas  
Conservation Board

Room 309  
Legislative Building  
Winnipeg, Manitoba, CANADA  
R3C 0V8

(204) 945-3130

JUL 31 1990

Mr. K.R. Brown, P. Eng.  
Manager, Reservoir Engineering  
Home Oil Company Limited  
1700 Home Oil Tower  
324 - 8 Avenue S.W.  
Calgary, Alberta  
T2P 2Z5

Dear Mr. Brown:

RE: South Pierson Area  
Special 32 ha Drilling Spacing Units

The Board has jointly reviewed Home's and Tundra's applications for special 32 ha drilling spacing units for the Lower Amaranth Formation in the South Pierson area.

The Board has extended the interim approval of 32 ha spacing to include the additional lands requested in the applications. A copy of Board Order No. SU 6 establishing 32 ha spacing units for the Lower Amaranth Formation is attached. Board Order No. SU 6 replaces Board Order No. SU 5 and includes the lands covered by that Board Order.

As with the previous approval, the Board has chosen to limit the term of the approval to October 31, 1991. The requirements for continuation of 32 ha spacing beyond that date remain unchanged from our letter dated October 5, 1989.

Home is also reminded of the continued applicability of the other requirements set out in that letter regarding submission of a waterflood feasibility study by August 31, 1991 and an annual pressure survey of the South Pierson Lower Amaranth B Pool. The Board requests that the annual pressure survey be extended to include the South Pierson Lower Amaranth C Pool and a number of other wells presently outside existing pool boundaries.

If you have any questions in respect of this matter, please contact L.R. Dubreuil, Director of Petroleum, or John Fox, Chief Petroleum Engineer, at (204) 945-6573 and 945-6574 respectively.

Yours respectfully,

ORIGINAL SIGNED BY  
IAN HAUGH

Ian Haugh  
Chairman

Encl.

Date typed: July 16, 1990

JF/cvs



The Oil and Natural Gas  
Conservation Board

Room 309  
Legislative Building  
Winnipeg, Manitoba, CANADA  
R3C 0V8

(204) 945-3130

JUL 31 1990

Mr. D. Barchyn, P. Eng.  
Exploration Manager  
Tundra Oil and Gas Ltd.  
1313 Richardson Building  
One Lombard Place  
Winnipeg, Manitoba  
R3B 0X3

Dear Mr. Barchyn:

RE: South Pierson Area  
Special 32 ha Drilling Spacing Units

The Board has jointly reviewed Tundra's and Home's applications for special 32 ha drilling spacing units for the Lower Amaranth Formation in the South Pierson area.

The Board has extended the interim approval of 32 ha spacing in the South Pierson area to include the additional lands requested in the applications. A copy of Board Order No. SU 6 establishing 32 ha spacing units for the Lower Amaranth Formation is attached. Board Order No. SU 6 replaces Board Order No. SU 5 and includes the lands covered by that Board Order.

As a result of concerns expressed by the Petroleum Branch and freehold mineral owners, who objected to these and previous applications, regarding the appropriateness of 32 ha spacing for the Lower Amaranth Formation and the limited amount of geological, reservoir, production and pressure data available, the Board has chosen to limit the term of the approval of 32 ha spacing to October 31, 1991.

If you wish to have the special drilling spacing units established by Board Order No. SU 6 extended past the expiry date, you are directed to submit, prior to August 31, 1991, an appropriate application under Section 20 of the Petroleum Drilling and Production Regulation. The application should include a review of the economics of developing the Lower Amaranth Formation on 16 ha spacing, paying particular attention to determination of the level of incremental recovery associated with reduced spacing.

HOME OIL - AL WILMS (403) 232-7362

• HOME TO APPLY FOR CONTINUATION ON ONLY  
LANDS OWN TO COMPANY - HOC TO  
SUPPLY LIST OF ADJACENT OWNERS W10/20

• TUNDRA (91-09-24) ASKED TO  
MAKE APPLIC FOR CONTINUATION, ETC.

• BOARD NOTICE TO REFER TO APPLS  
AND PREVIOUS ORDER FROM

Tundra is requested to conduct an annual pressure survey on at least one well in Section 22-2-29 (WPM) commencing this year to determine the static reservoir pressure. Tundra shall submit to the Petroleum Branch a list of the well(s) to be surveyed, the measurement technique to be used and the intended shut-in time for the well(s) and approval shall be obtained from the Director of Petroleum before the survey is carried out.

If you have any questions in respect of this matter, please contact L.R. Dubreuil, Director of Petroleum, or John Fox, Chief Petroleum Engineer, at 945-6573 and 945-6574 respectively.

Yours respectfully,

ORIGINAL SIGNED BY  
IAN HAUGH

Ian Haugh  
Chairman

Encl.

Date typed: July 16, 1990

JNF/cvs



**JUL 31 1990**

South West Oil Limited  
P.O. Box 855  
Melita, Manitoba  
ROM 1L0

Dear Sir:

RE: South Pierson Area  
Application for 32 ha Drilling Spacing Units

Your objection to Home Oil Company Limited's and Tundra Oil and Gas Ltd.'s applications for 32 ha drilling spacing units for the Lower Amaranth Formation in the South Pierson area is hereby acknowledged.

After careful consideration of the technical and economic information filed by Home Oil and Tundra in support of their applications and the concerns expressed in your objection, the Board has approved the applications for an interim period.

Attached for your information is a copy of Board Order No. SU 6 approving on an interim basis 32 ha drilling spacing units for the Lower Amaranth Formation in the South Pierson area.

In recognition of concerns regarding the appropriateness of 32 ha spacing and the limited amount of technical information presently available, the Board has limited the term of the approval to October 31, 1991. Any application for continuation of 32 ha spacing past this date will have to address the level of incremental recovery that could be expected on reduced 16 ha spacing.

If you have any questions in respect of this matter, please contact L.R. Dubreuil, Director of Petroleum, or John Fox, Chief Petroleum Engineer, at 945-6573 or 945-6574 respectively.

Yours respectfully,

ORIGINAL SIGNED BY  
IAN HAUGH

Ian Haugh  
Chairman

Encl.

Date typed: July 18, 1990

JF/ibj

Date July 5, 1990

# Memorandum

To The Oil and Natural Gas  
Conservation Board  
Ian Haugh, Chairman  
H. Clare Moster, Deputy Chairman  
Wm. McDonald, Member

From John Fox  
Chief Petroleum Engineer  
Petroleum Branch

Telephone

Subject APPLICATION FOR 32 SPACING - SOUTH PIERSON AREA

Home Oil Company Limited and Tundra Oil and Gas Ltd. have made separate applications for special 32 ha drilling spacing units for the Lower Amaranth Formation in the South Pierson area. The applications were jointly advertised. One objection was filed.

## RECOMMENDATIONS

It is recommended that the Board approve the enlargement of 32 ha spacing for the Lower Amaranth Formation in the South Pierson area for an interim period ending October 31, 1991. A copy of the proposed Board Order No. SU 6 is attached. Board Order No. SU 6 includes the lands covered by Board Order No. SU 5 and rescinds that Order.

## DISCUSSION

Board Order No. SU 5 (October 4, 1989) established temporary 32 ha spacing for the Lower Amaranth Formation in the South Pierson area (Figure 1). Home and Tundra have applied to extend 32 ha spacing to include an additional 8 3/4 sections containing the South Pierson Lower Amaranth C, D and E Pools and other lands adjoining the area covered by Board Order No. SU 5 (Figure 1).

The South Pierson area has been the target of renewed activity. During 1990 a total of 21 wells have been licenced of which 13 have been drilled to date (Figure 1). Eleven wells are within the area of application while the other 10 are within the area covered by Board Order No. SU 5.

## Production Performance and Reserves Estimates

Home and Tundra have provided very different estimates of well performance and recoverable reserves in their respective applications. Table 1 lists the individual well production and reserves estimates provided by the two companies.

Home's estimate of recoverable reserves is 10 976 m<sup>3</sup>/well or 12% of the OOIP on 32 ha spacing, unchanged from its previous application (January 4, 1989). Home continues to maintain that reduced 16 ha spacing will not result in any incremental recovery.

Home's estimate is based on decline curve analysis for 6 wells in the field. A composite production plot of the 6 wells is shown in Figure 2. The Petroleum Branch's estimate of recoverable reserves for the 6 wells is 78,759 m<sup>3</sup> or 12.4% of the OOIP on 32 ha spacing which matches closely with Home's estimate of 80,270 m<sup>3</sup>.

Tundra estimates recoverable reserves of 3 846 m<sup>3</sup>/well or 7.8% of OOIP on 32 ha spacing and 2 472 m<sup>3</sup>/well or 10% of OOIP on 16 ha spacing. Tundra's lower estimates appears to reflect the performance of the well 4-22-2-29 which may be in a less permeable portion of the reservoir near the updip edge of the pool.

### Economics

The basis of both Home's and Tundra's applications is that the South Pierson area is uneconomic to develop on 16 ha spacing. A comparison of the companies' economics of developing the pool on 16 ha and 32 ha spacing is shown in Table 2.

Home has reduced its capital costs from \$444 000 in its previous application to \$320 000. Home's price forecast is also very optimistic at \$130.42/m<sup>3</sup> in 1990 (average Manitoba oil price May 1990 - \$116/m<sup>3</sup>) and increasing approximately 6%/yr. Development on 32 ha is quite attractive with a net present value of \$176 600, a 33% rate of return and a 2.7 year pay-out. However, development on 16 ha spacing assuming no incremental recovery remains uneconomic.

Tundra's capital costs are only 65% of Home's, however the recoverable reserves used by Tundra are 65% and 55% less than Home's for 32 ha and 16 ha spacing, respectively. Development on 32 ha is attractive with a net present value of \$30 000, a 34% rate of return and a 1.9 year pay-out. However, development on 16 ha spacing which Tundra assumes will result in an incremental recovery of 500 m<sup>3</sup>/well or 2.2% of the OOIP is uneconomic.

For both companies the critical issue surrounding the economics of development on 16 ha spacing is the level of incremental recoverable reserves that can be expected. It is difficult to accept both Home's position that 16 ha spacing will not result in some incremental recovery and Tundra's position that 16 ha spacing will only result on a 2.2% increase in recovery. However, without further geological, production and pressure data it is impossible to quantify the incremental recovery that could be expected on 16 ha spacing.

### Notice of Applications

Notice of Home's and Tundra's applications were jointly published in the Manitoba Gazette (90-06-09) and the Melita New Era (90-06-05).

Unlike Home's previous application for 32 ha spacing which resulted in objections from 6 freehold mineral owners having concerns regarding the effect of 32 ha spacing on recovery, royalties and offset obligations, only one objection to the applications was filed.

The objection was filed by a freehold mineral owner with an interest in Section 19-2-29 (WPM) who made an unsupported request that spacing in Section 19 remain at 16 ha because 32 ha spacing will result in lower production and therefore less royalties in the short term..

#### Proposed Enlargement of 32 ha Spacing

The Board when it issued Board Order No. SU 5, recognized the concerns of the Petroleum Branch and mineral owners regarding the appropriateness of 32 ha spacing and the limited amount of technical information presently available. For the above reasons 32 ha spacing was approved for an interim period of two years ending October 31, 1991.

No new supporting technical or economic information was filed by either Home or Tundra with the current applications, nor has any additional information come to light that would call into question the appropriateness of approving 32 ha spacing for the additional lands under the same conditions as set out in Board Order No. SU 5.

Enlarging the 32 ha spacing approval to include the additional lands will ensure the following objectives continue to be met;

- 1) the pool is developed in an orderly manner,
- 2) the correlative rights of freehold mineral owners and the Crown are protected,
- 3) additional reservoir, production and pressure data can be collected and analyzed,
- 4) the drilling of potentially unnecessary wells on 16 ha spacing is avoided,
- 5) reduction of the concern that the pool will be rapidly depleted below the bubble point before an enhanced recovery scheme can be implemented,
- 6) there is no reduction in the ultimate recovery from the pool, (i.e. approval is not irreversible) and
- 7) any uncertainty regarding the economics of development on 16 ha spacing is reduced.

It is therefore recommended the Board Order No. SU 6 be issued approving 32 ha spacing for both the lands covered by Board Order No. SU 5 and the additional lands for an interim period ending October 31, 1991. Board Order No. SU 5 will be rescinded. The mineral owner that objected to the application should be notified of the Board's decision.

Home Oil has requested that the 11-19-2-29 (WPM) well which will be off-target under the proposed 32 ha spacing approval be deemed on target. This is a reasonable request and should be approved as long as the 11-19 well remains the only producing well in the spacing unit.

## Other Matters

In conjunction with Board Order No. SU 5, Home Oil was requested by the Board in its letter dated October 5, 1989 to conduct an annual pressure survey in the South Pierson Lower Amaranth B Pool and to review the feasibility of waterflooding the pool. The Board also indicated that an application to continue 32 ha spacing beyond October 31, 1991 would have to include a detailed evaluation of the incremental recovery that could be expected on 16 ha spacing.

It is proposed to reiterate these conditions in the Board letter of transmittal to the companies that will accompany the Board Order.

ORIGINAL SIGNED BY  
JOHN N. FOX

John N. Fox

Original Signed By  
L. R. DUBREUIL

Approved by: \_\_\_\_\_  
L.R. Dubreuil, Director

**TABLE 1**  
**RESERVE ESTIMATES**

	<u>32 ha Spacing</u>		<u>16 ha Spacing</u>	
	Home	Tundra	Home	Tundra
Initial Productivity (m <sup>3</sup> OPD)	7.0	4.0	7.0	4.0
Decline Rate (%/yr)	21	25	43	40
Recoverable Reserves (m <sup>3</sup> )	10976	3846	5500	2472
Primary Recovery Factor (%)	12	7.8*	12	10*

\*Petroleum Branch estimate based on OOIP for 4-22-2-29.

TABLE 2  
DEVELOPMENT ECONOMICS

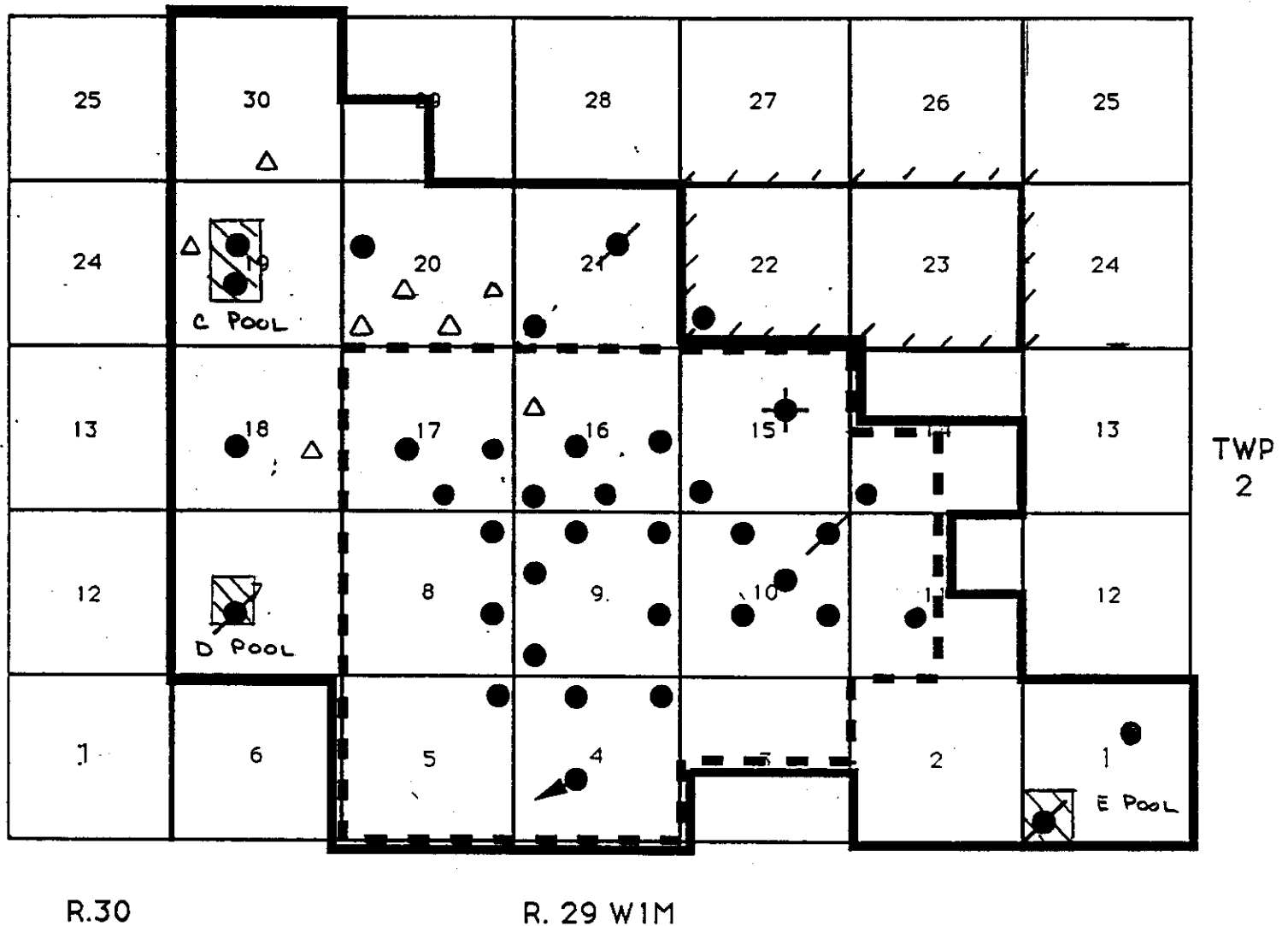
	<u>32 ha Spacing</u>		<u>16 ha Spacing</u>	
	Home	Tundra	Home	Tundra
Capital Costs(\$M)	320	210	320	210
Operating Costs				
Fixed (\$/well/mon)	1500	1000	1500	1000
Variable (\$/m <sup>3</sup> )	15.00	13.70	15.00	13.70
1990 Oil Price (\$/m <sup>3</sup> )	130.42	132.10	130.42	132.10
Oil Price Escalation (%/yr)	6.0	5.0*	6.0	5.0*
Recoverable Reserves (m <sup>3</sup> )	10,976	3,846	5,500	2,472
Net Present Value (AIT)(\$M)	176.6**	30.0 <sup>+</sup>	-6.3**	-18.0 <sup>+</sup>
Rate of Return (%)	33.1	34.1	10.7	9.4
Payout (yrs)	2.7	1.9	3.9	2.7

\* Tundra's oil prices is constant at \$132.10/m<sup>3</sup> for 1990 & 1991

\*\* Home's discount factor = 12%

+ Tundra's discount factor = 20%

# SOUTH PIERSON AREA



AREA OF 32 HA SPACING:

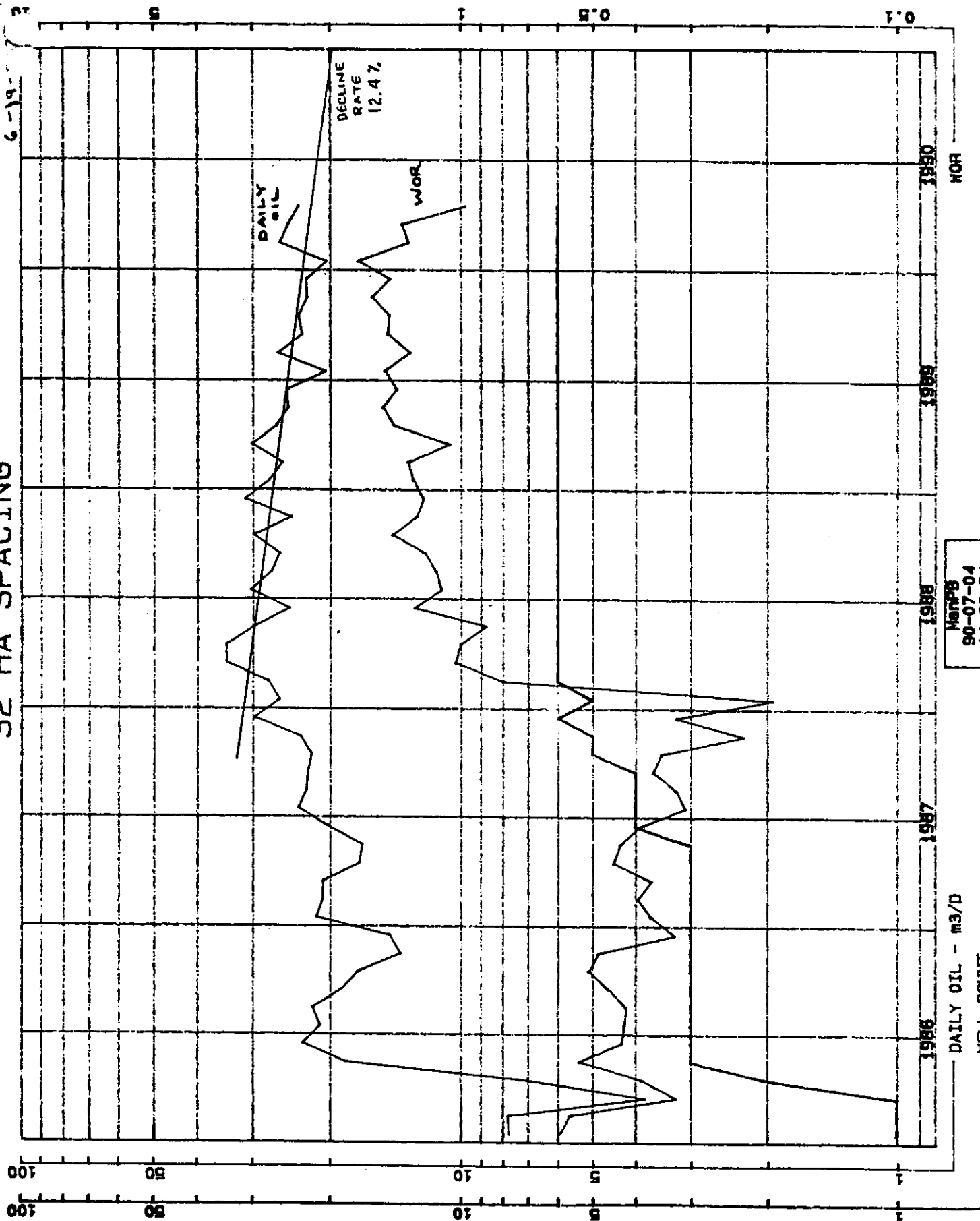
- CURRENT - BOARD ORDER NO. 54 5
- EXPANDED - WONE OIL
- /// EXPANDED - TUNDRA
- Δ LICENCED LOCATIONS

FIG. 1



# 32 HA SPACING

16-3-2-29  
16-8-2-29  
16-9-2-29  
8-10-2-29  
4-15-2-29  
6-19-2-29



ManPB  
90-07-04  
14-33-01

DAILY OIL - m3/D  
WOR

WOR

FIG

The Oil and Natural Gas  
Conservation Board

Room 309  
Legislative Building  
Winnipeg, Manitoba, CANADA  
R3C 0V8

(204) 945-3130

**Order No. SU 6**

**An Order Pertaining to Drilling Spacing Units  
South Pierson Area  
Lower Amaranth Formation**

WHEREAS, subsection (9)(b) of section 62 of "The Mines Act", being Chapter M160 of the Continuing Consolidation of the Statutes of Manitoba, provides as follows:

"62(9) Without restricting the generality of subsection (8) the board, with the approval of the minister, may make orders

(b) respecting the designation of the area that shall be allocated to a well in connection with fixing allowable production;"

AND WHEREAS, clause (1)(f) of section 63 of "The Mines Act" being Chapter M160 of the Continuing Consolidation of the Statutes of Manitoba, provides in part as follows:

"63(1) For the purpose of carrying out the provisions of this Part and Part III according to their intent, the Lieutenant Governor in Council may make such regulations and orders as are ancillary thereto, and are not inconsistent therewith; and every such regulation or order made under, and in accordance with the authority granted by, this section has the force of law; and, without restricting the generality of the foregoing, the Lieutenant Governor in Council may make regulations and orders,

(f) prescribing spacing units and the size and shape of spacing units;"

AND WHEREAS, subsection (1) of section 20 of Manitoba Regulation 430/87R under The Mines Act ("the Petroleum Drilling and Production Regulation") provides as follows:

"20(1) Notwithstanding section 19, the board may, after a public hearing or after publication of notice, prescribe by order special drilling spacing units which may differ from normal drilling spacing units in size, shape or target area."

AND WHEREAS, subsection (3) of section 21 of the Petroleum Drilling and Production Regulation provides as follows:

"21(3) Where a special drilling spacing unit is prescribed under section 20, the board may prescribe the target area within which a well shall be completed in order to qualify for a maximum permissible production rate based on the area of the special drilling spacing unit."

AND WHEREAS, the Board received an application dated April 3, 1990 from Tundra Oil and Gas Ltd. and an application dated May 17, 1990 Home Oil Company Limited for approval of special 32 ha drilling spacing units for the Lower Amaranth Formation in the South Pierson area ("the area of application").

AND WHEREAS, upon publication of notice of the application, the Board received an objection to the application.

AND WHEREAS, upon due consideration of the said applications and objection thereto, the Board considers temporary establishment of special 32 ha drilling spacing units for the Lower Amaranth Formation in the area of application to be reasonable and desirable.

NOW THEREFORE, the Board orders that:

1. The spacing unit for each well drilled, or to be drilled, for the purpose of obtaining oil from the Jurassic Lower Amaranth Formation within the area outlined on Schedule A is two legal subdivisions comprising the east half or the west half of a quarter section.
2. The target area of each drilling spacing unit shall be a square area in the even-numbered legal subdivision having sides one hundred metres from the sides of the legal subdivision and parallel to them.
3. This order expires October 31, 1991 unless rescinded by the Board prior to this date.
4. Board Order No. SU 5 dated October 4, 1989 is hereby rescinded.

---

H. Clare Moster  
Deputy Chairman

---

Ian Haugh  
Chairman

OIL AND NATURAL GAS CONSERVATION  
BOARD ORDER NO. SU 6 APPROVED THIS  
DAY OF A.D., 1989  
AT THE CITY OF WINNIPEG.

APPROVED:

---

Harold Neufeld  
Minister of Energy and Mines

Use 32 ha spacing for application of 12/50

May 17/90

PIERSON AREA - 32 ha Spacing + NPR's

- HDC 32 ha spacing and increase NPR's optimum standpoint of  
for field development - primary depletion from a conservation &  
prudent depletion planning
- apply permanent 32 ha spacing & NPR increase  
for both LAM & MC
- wells can adequately drain 32 ha within a  
reasonable time frame
- simulation study identified communication between  
the LAM & MC - resulted in study of WF  
feasibility study
- no adverse effect on cumulative rights of  
that Ro
- benefits 32 ha spacing reduced well density,  
lower <sup>ws.</sup> withdrawal rate per unit res. vol.
- working on optimum depletion strategy - 1 yr req'd
- need for PM implementation 2 1/2 - 3 yrs (near BP perm.)  
develop/monitor areas of pool

- 3D numerical simulation model used to evaluate incremental recovery or reduced 16 ha spacing & feasibility of waterflooding

\* - Figure showing model study area

- difficulty history matching model
- when LA modelled as a volumetric reservoir reservoir pressure should have declined from 10500 kPa to 4550 kPa bubble pt pressure in mid-1990 note: current reservoir pressure is approx 9000 kPa & GOR's indicate reservoir is still saturated  $\rightarrow$  different from performance observed in Westlake Field
- Hume's belief NE is providing limited pressure support to LAm via induced hydraulic fractures and/or extensive in-situ fractures of Mississippi caprock - formations in communication
- decline analysis yields RF = 10-12% OOIP @ 32 ha spacing - cumulative recovery to date range 1.5 - 6.5% OOIP

#### NPR

- Huc opinion increased NPR not affect ultimate recovery
- only one well, 16-9-2-29 is capable of producing in excess of 8 m<sup>3</sup>/d
- not promote significant decline reservoir press.
- no inequitable drainage concerns.

## HOC - QUESTION

- development plans - total undeveloped spacing units 84 versus 53 wells drilled

Tundra 15 undeveloped vs 3 wells drilled

- economics - 1991 capital cost drill, complete, equip tie-in \$250 m
- previous economics 1990 capital cost \$320M (1989 cost \$444)
- review of economics
- need to review miss caprock thickness

O/W 2 - 555 m ss

- aver. res. pres = 8000 kPa.

- performance plots pre-1990 wells, all wells, review individual decline rates for 16-5, 8-10, 14-9, 4-15, 16-8

16-9, 6-19 - Jan 90 Decline rate = 12.4%

Jul 90 P.B. estimate recovery = 78789  
RF = 12.4%  
OOIP = 635400

- individual well current recoveries / predicted ultimate

- composite well decline analysis
- |      |      |      |      |
|------|------|------|------|
| 16-5 | 16-9 | 4-15 | 14-9 |
| 16-8 | 8-10 | 6-19 |      |

- Board letter dated Oct 5/89 - HOC asked to address review of economics of developing on 16 ha spacing paying particular attention to determination of the level of incremental recovery associated with reduced spacing

- <sup>addition</sup> continuing appropriateness of 32 La San LAm in Pecos

- interim appraisal accomplishments

- a) continued prod development & orderly reserves
- b) additional technical & performance data — ENOUGH (?)
- geological reserves, pressure, production

→ JULY 1990

- expansion of area under S46 (review - how many wells drilled) protect competitive rights & avoided the drilling of potentially unnecessary wells

34 sections

- wells drilled S46 expanded area Sec 1, 2, 7, SE 1/4-11, SE 1/4-14, 18, 19, 20, 21, SW 1/4-29, 30 after S44 5 approved (OCT 4/89)

S46  
\* of reserves ~~increased~~  
after order  
- III (2 TUBES)

before order  
- III - III (1 TUBES)  
III

S45  
\* of reserves ~~increased~~  
after order with area of order  
- III - III

III

N. Arbez LAm Study decline rates	16-3	252	} over 12% over RF = 16%
	16-8	91	
	16-9	192	
	4-15	12%	



- continuation of 16 ha spacing for Mission Canyon to allow selection of optimum drilling locations
- first NE pole 1 reservoir - C. Gibson

## Background

- Pioneer L.A. C Pool was discovered in 1985.
- Technical data that supports 32 ha drainage
  - (1) estimate recoverable reserves & recovery factor (HOC pressure est. PF = 12% core)
  - (2) pressure data
- primary recovery Waskada L.A. A pool - 12.2% core
- Economics indicate feasibility of 16 ha spacing is dependent on the level of recoverable recovery, oil prices, and capital cost

objectives of 32 ha spacing

- 1) pool is developed in an orderly manner
- 2) correlative rights of mineral owners including the crown are protected
- 3) additional reservoir information - production, pressure, log & fluid properties collected/analyzed
- 4) avoids the drilling of potentially unnecessary wells on 16 ha spacing
- 5) address concern that pool will be rapidly depleted below the bpt pressure

## Hoe Outcrops

- would also bring forward a wave of influx of Mission Canyon water  
(secondary objective)
- Hoe Mission Canyon deposition strategy
- prior resumption history and also account of DC Pools + Tundin's / Ly'abru's plans for commingling LAM / DC
- Hoe concerned DC offsets called in 16 ha
- area of appl<sup>d</sup> DC characterized by a series of subcropping zones the majority of which are wet.
- DC pools, thin, limited areal extent
- previous application suggested resources be used using a 5% non-incremental recovery for 16 ha spacing

Hoe - homogeneous finely interbedded silty shale sandstone with soft gas drive →

- (6) no reduction in ultimate recovery
- (7) reduce uncertainty surrounding economics of 16 ha development

- issue of enhanced recovery feasibility not adequately addressed

- is there a concern that an unfavourable decision will adversely affect interest in MB

- land let go by 40C over last year

LSD 11 & 14 - 17, LSD 1 & 2 + NW/4 - 3, Sec 6, SE/4 - 4  
SE/4 - 11, SE/4 - 14, NE/4 - 20

COMPARISONS RECENT WASKADA LAL A Paul PM a d  
Reduced spacing APPLICATIONS

- check survey to bubble pt. (craft & Hawkins)

INITIAL PRODUCTION  
1ST - 4 MONTHS

HONE PIERSON WELLS DRILLED IN 1991

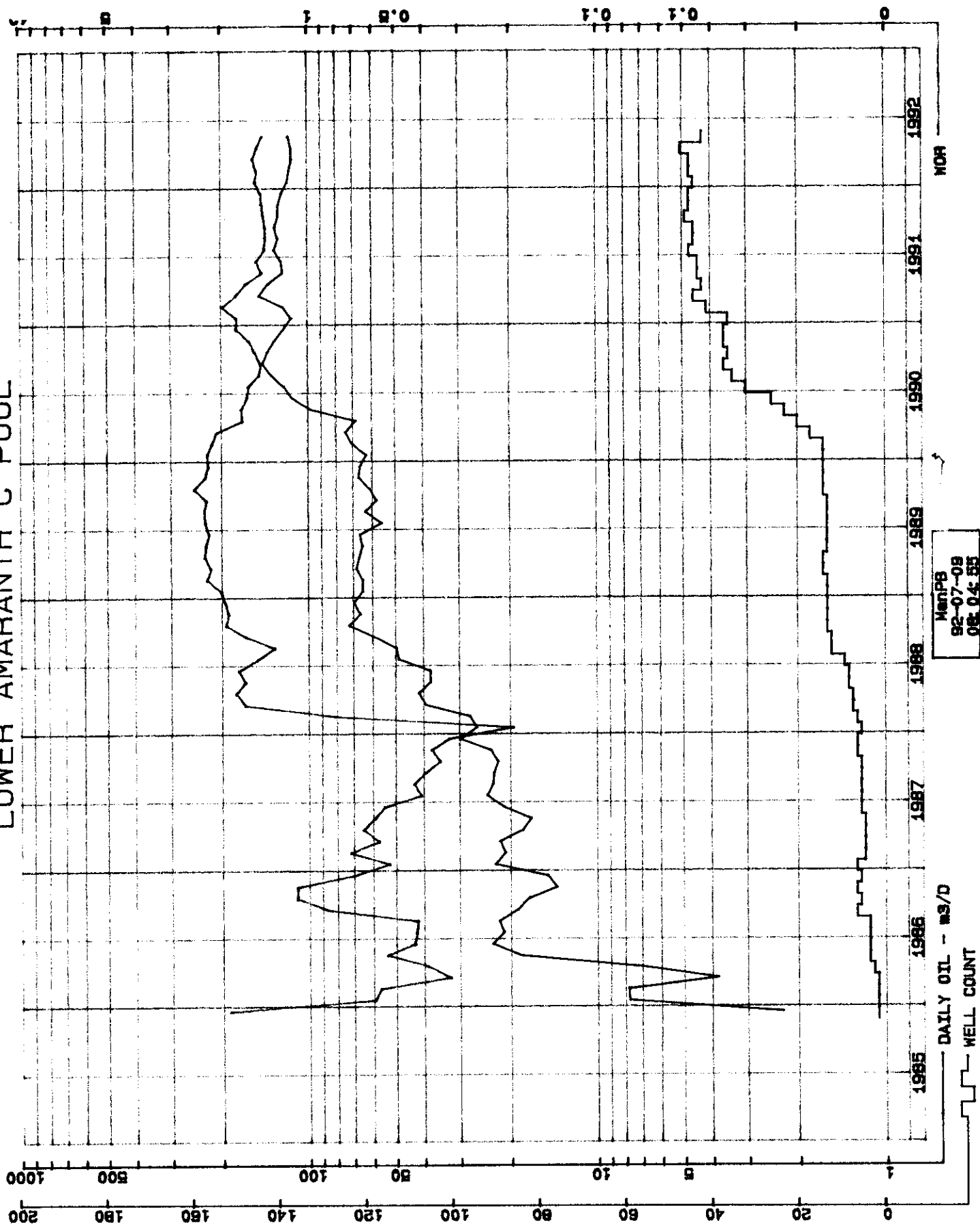
4-17-2-29	3.26 m <sup>3</sup> /d
10-17-2-29	3.10 m <sup>3</sup> /d
12-17-2-29	2.48 m <sup>3</sup> /d
16-18-2-29	0.7 m <sup>3</sup> /d
16-19-2-29	5.76 m <sup>3</sup> /d
14-11-2-29	0.99 m <sup>3</sup> /d
12-8-2-29	5.49 m <sup>3</sup> /d
10-19-2-29	5.9 m <sup>3</sup> /d
4-31-2-29	3.5 m <sup>3</sup> /d

AVERAGE

---

3.1 m<sup>3</sup>/d

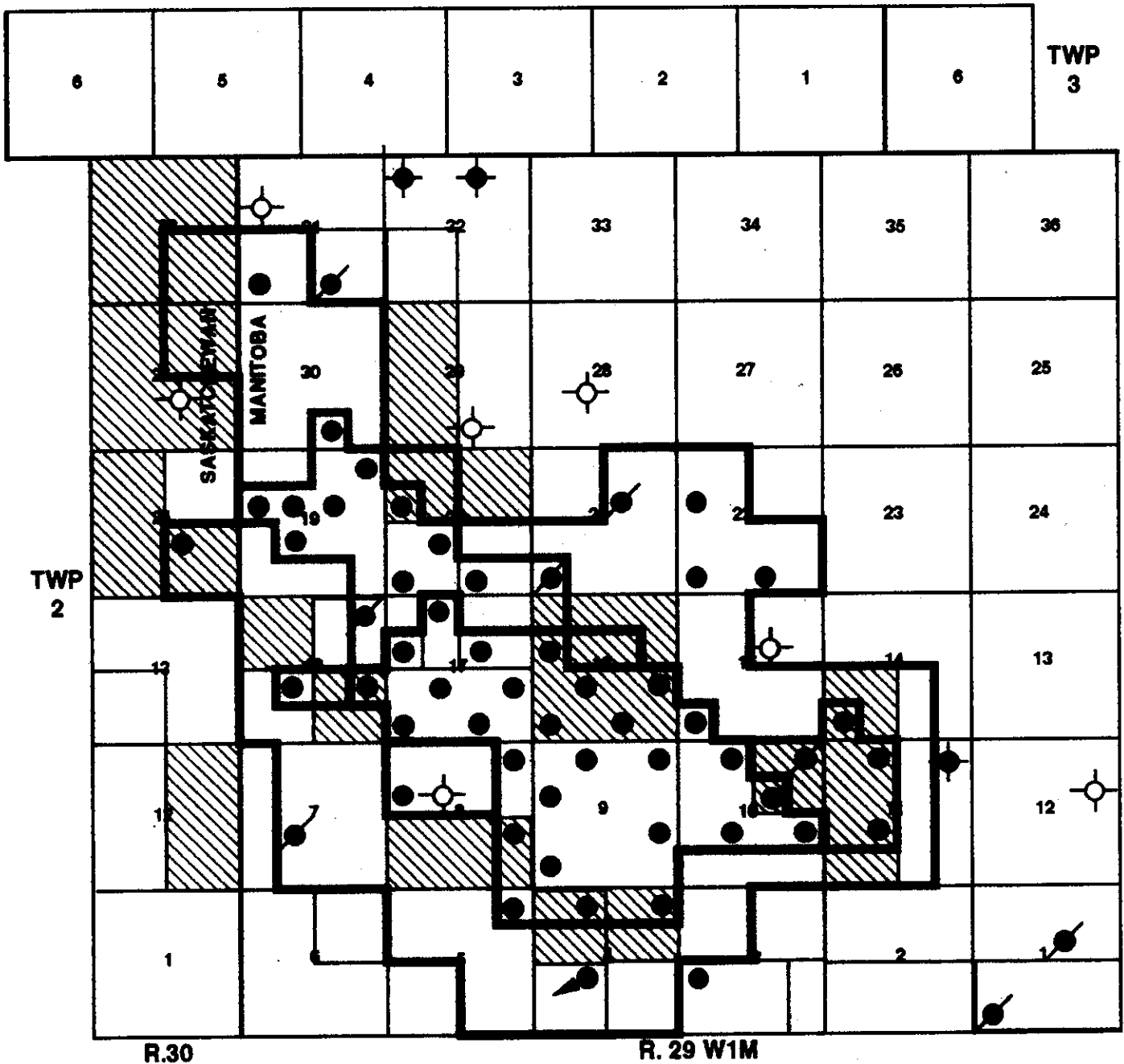
# LOWER AMARANTH C POOL



ManiPB  
92-07-08  
08:04:55

1

# SOUTH PIERSON AREA



- |                                                                                                     |                                                                                                     |                                                                                                     |
|-----------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|
|  HOC / SRO LANDS |  PROJECT AREA    |  CURRENT WELLS |
|  POOL OUTLINE    |  WATERFLOOD AREA |                                                                                                     |

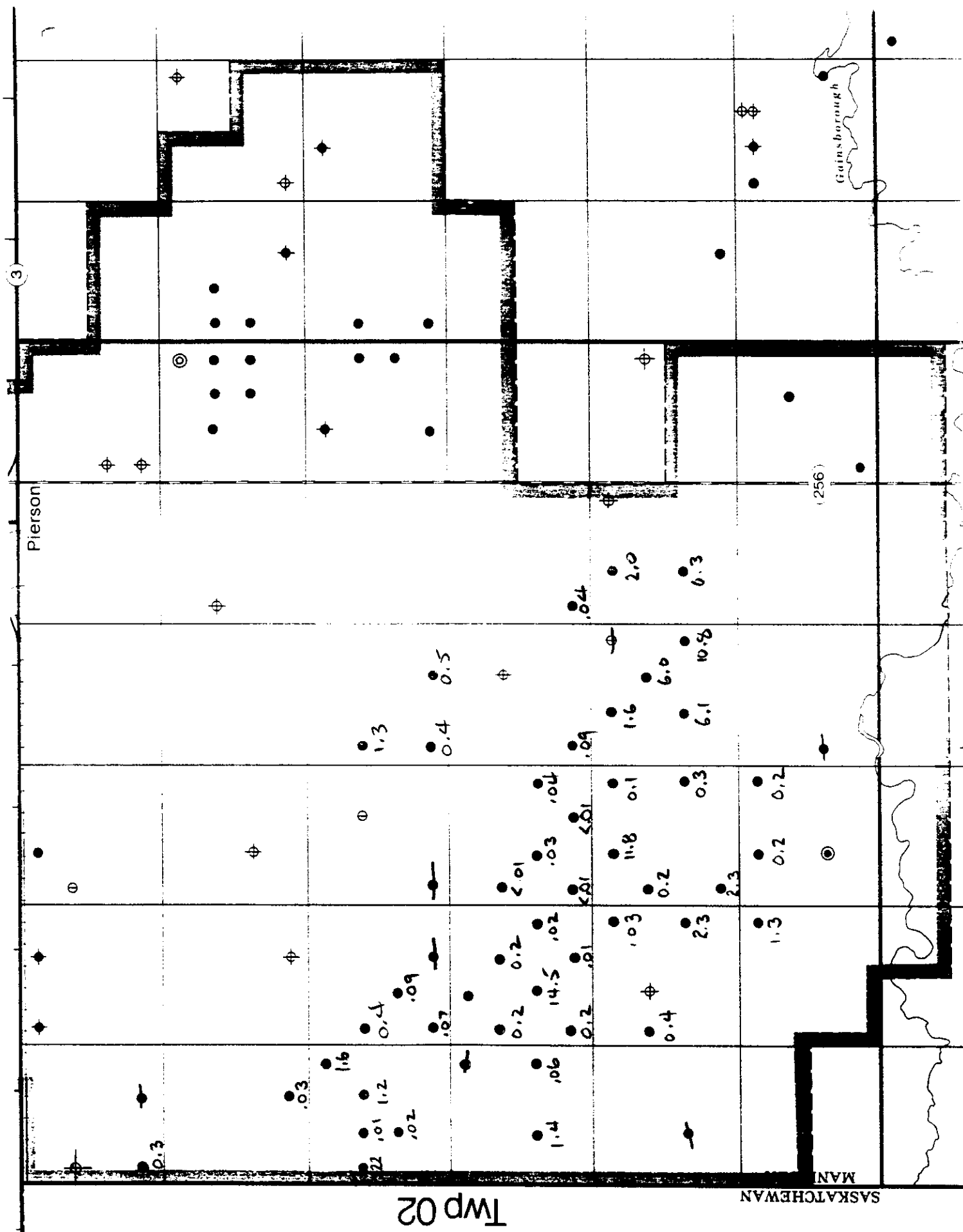
Hone's  
Project area &  
WATERFLOOD AREA  
OUTLINES

**A**



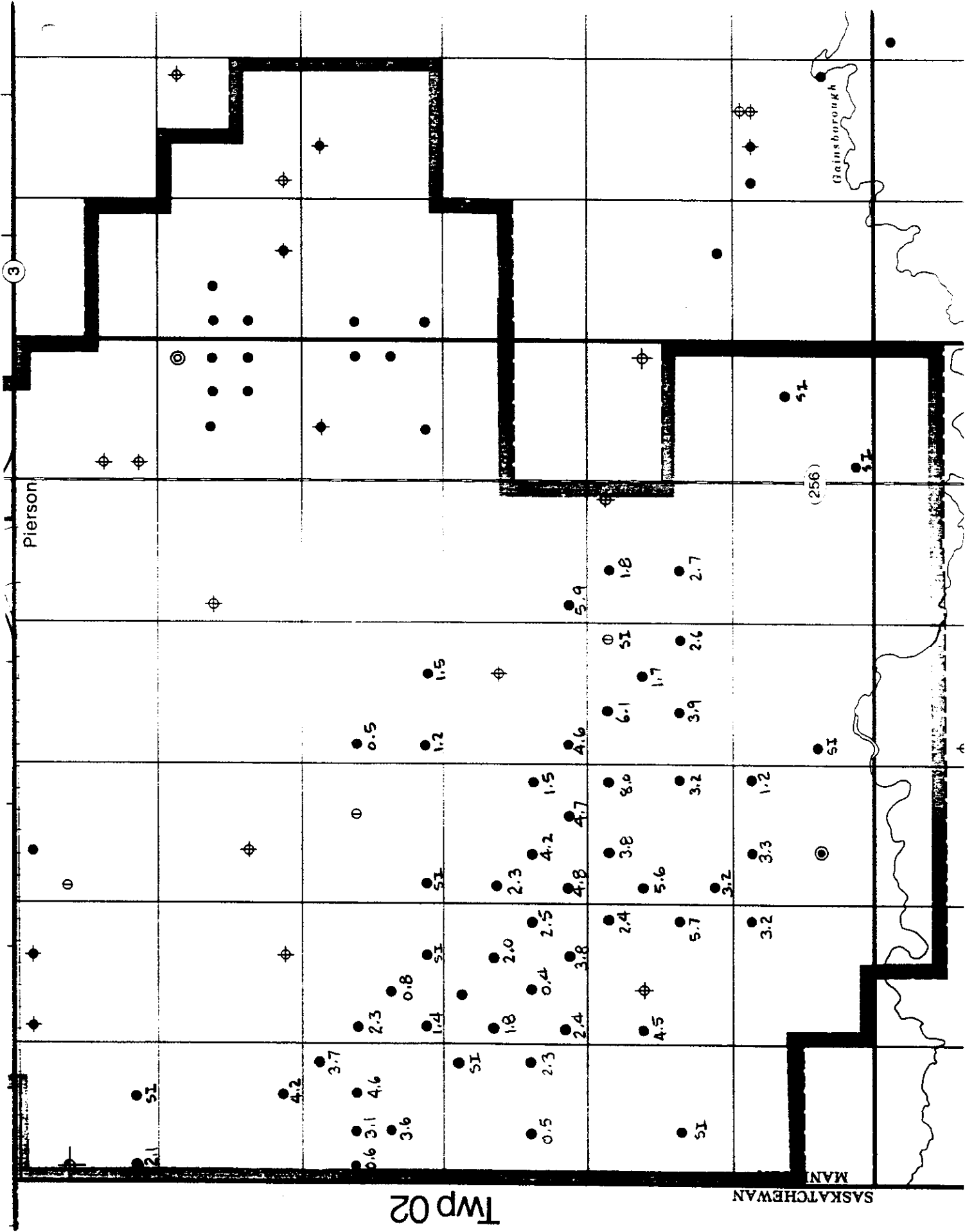


CURRENT WORK





DAILY OIL



SASKATCHEWAN

Twp 02

LANDS CONSIDERED FOR EXCLUSION  
FROM 32 ha SPACING APPROVAL

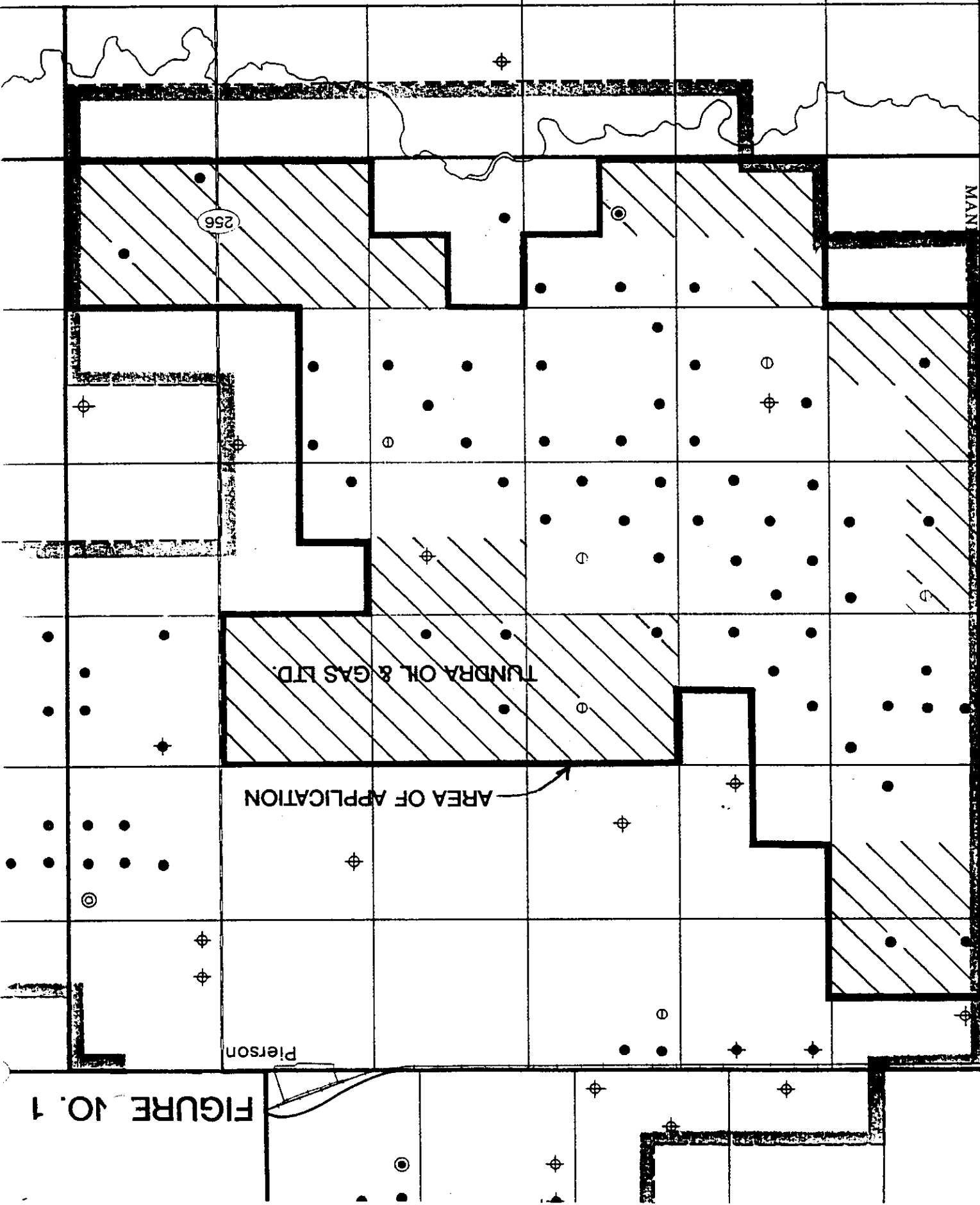
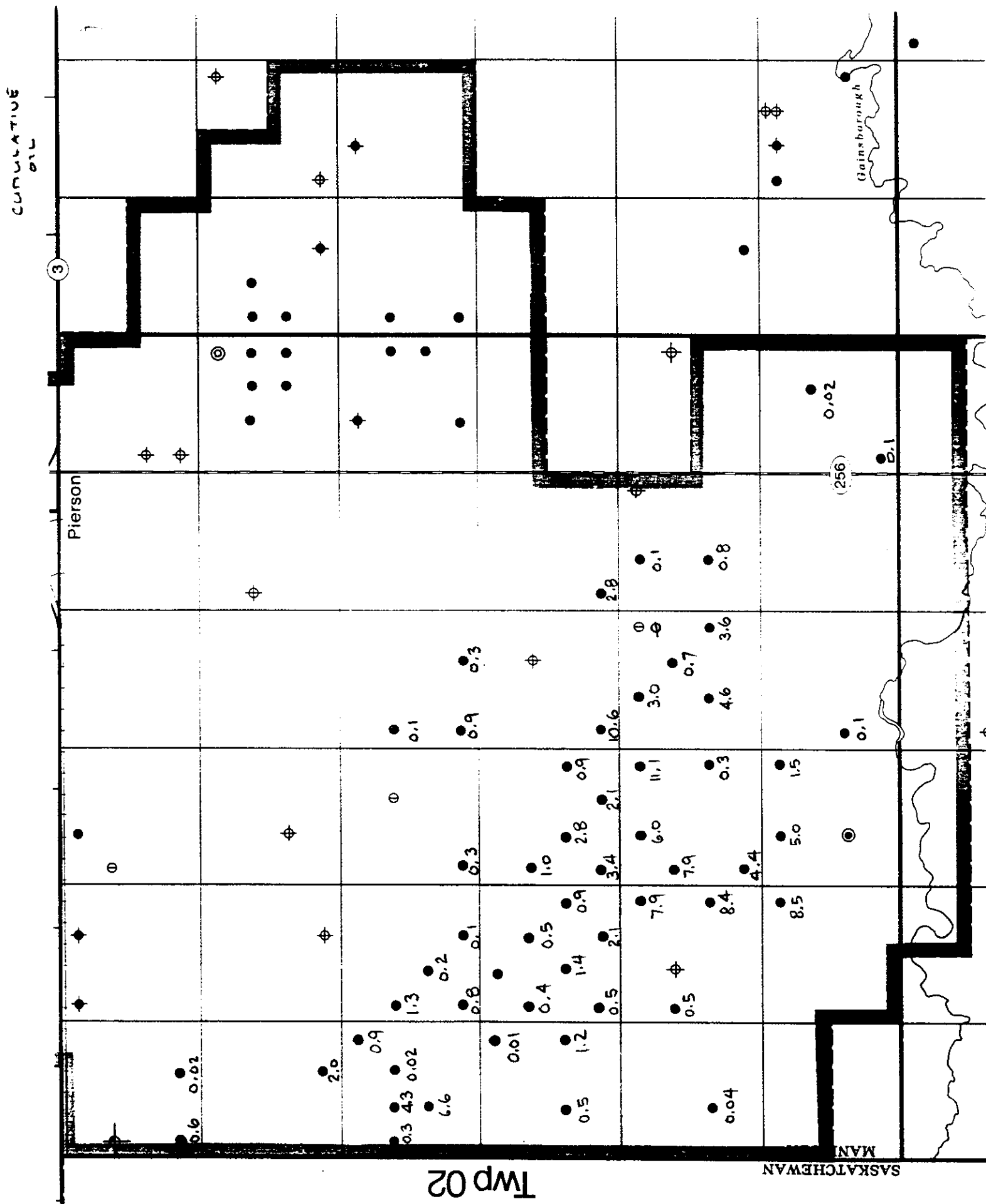


FIGURE 10.1



[illegible]

**SASKATCHEWAN**

T. R. Daniels and  
J. M. K. Daniels  
General Delivery  
Pierson, Manitoba  
ROM 1S0\_

K. Daniels and  
G. F. Douglas  
General Delivery  
Sub. P.O. 6  
Brandon, Manitoba  
R7B 0M0\_

Estate of Lowell Gough Stevens  
Royal Trust Corporation of Canada  
Box 748  
Winnipeg, Manitoba  
R3C 2M2\_

Audry Elaine Carr  
576 Johnson Avenue East  
Winnipeg, Manitoba  
R2L 1A8\_

Ryan James Carr  
Box 401  
Gillam, Manitoba  
R0B 0L0\_

Ardeen May Sokalski  
733 Charleswood Road  
Winnipeg, Manitoba  
R3R 1K7\_

Gladys Sarah Patmor  
General Delivery  
Pipestone, Manitoba  
ROM 1T0\_

David James Southam  
Pierson, Manitoba  
ROM 1S0\_

Stewart John Southam  
Pierson, Manitoba  
ROM 1S0\_

Robyn Henry Lore  
36 Hutton Crescent S.W.  
Calgary, Alberta  
T2V 3B7\_



Moral Re-Armament  
(The Oxford Group in Canada)  
387 Cote Sainte Catherine  
Montreal, Quebec  
H2V 2B5\_

Shell Canada Limited  
400 - 4th Avenue S.W.  
Calgary, Alberta  
T2P 0J4\_

Scurry-Rainbow Oil Limited  
1700 - 324 - 8th Avenue S.W.  
Calgary, Alberta  
T2P 2Z5\_

Chevron Canada Resources  
500 - 5th Avenue S.W.  
Calgary, Alberta  
T2P 0L7\_

East Plains Resources Limited  
1090 - 700 - 9th Avenue S.W.  
Calgary, Alberta  
T2P 3V4\_

T.D.L. Petroleum Inc.  
Box 700  
Carnduff, Saskatchewan  
S0C 0S0\_

Omega Hydrocarbons Ltd.  
1300 - 112 - 4th Avenue S.W.  
Calgary, Alberta  
T2P 0H3\_

*E*

Troy Oils Ltd.  
705 - 805 - 85th Street S.W.  
Calgary, Alberta  
T2P 1H7\_

Andrew Thomas Brown  
Box 2157  
Brandon, Manitoba  
R7A 6X5\_

*(11)*

Pearl MacLean  
Ste. 105, 218 - 4th Street  
Brandon, Manitoba  
R7A 3G8\_

Theodore Joseph Artz and  
Rebecca Susanne Artz  
P.O. Box 85  
Lyleton, Manitoba  
R0M 1G0\_



PanCanadian Petroleum Limited  
Box 2850  
Calgary, Alberta  
T2P 2S5\_

South West Oil Limited  
P.O. Box 855  
Melita, Manitoba  
ROM 1L0\_

Sarah Ruby Caney  
Box 1013  
Virden, Manitoba  
ROM 2G0\_

Wayne Gordon Tingey  
Box 95  
Lyleton, Manitoba  
ROM 1G0\_

Trent Wayne Tingey  
Box 95  
Lyleton, Manitoba  
ROM 1G0\_

Adele Celeste Tingey  
Box 95  
Lyleton, Manitoba  
ROM 1G0\_

Ramona Mae Murray  
Box 129  
Melita, Manitoba  
ROM 1L0\_

Edith D.M. Erixon  
Box 39  
Lyleton, Manitoba  
ROM 1G0\_

Kenneth K. Foster  
1820 Abbot Street  
Kelowna, British Columbia  
V1Y 1B5\_

Cautantowwit Holdings Ltd.  
26 Mariner Crescent  
Winnipeg, Manitoba  
R2P 0V4\_

Earle Fletcher  
Coulter, Manitoba  
ROM 0G0\_

Norman Glintz and Willis Glintz  
Box 78, Route #2  
Bottineau, North Dakota  
58318\_

Winnifred Anne Law  
Lyleton, Manitoba  
ROM 1G0\_

Muriel May Bird  
Pierson, Manitoba  
ROM 1S0\_

Ralph Raymond Law  
Melita, Manitoba  
ROM 1L0\_

Kathleen Louise Martinovsky  
P.O. Box 1  
Gerald, Saskatchewan  
S0A 1B0\_

South West Oil Limited  
P.O. Box 855  
Melita, Manitoba  
ROM 1L0\_

Gerald Ralph Dressler  
1116 Rosser Avenue  
Box 954  
Brandon, Manitoba  
R7A 5Z9\_

Kevin Marcus Kearns  
6215 North 31st Drive  
Phoenix, Arizona  
85017\_

Joel Keith Morgan  
59 Beaver Ridge  
Ottawa, Ontario  
K2E 6E2\_

10  
Crossman Petroleums Ltd.  
Box 149  
Pierson, Manitoba  
ROM 1S0\_

The Rural Municipality of Edward  
Box 100  
Pierson, Manitoba  
ROM 1S0\_

Canada Trust Company  
c/o Montreal Trust  
411 - 8th Avenue, S.W.  
Calgary, Alberta  
T2P 1E7\_

George Douglas Hart  
331 Wainwright Road, S.E.  
Calgary, Alberta  
T2J 1H9\_

Charles Thomas Nicoll  
Box 246  
Treherne, Manitoba  
R0G 2V0\_

William John Nicoll  
Box 246  
Treherne, Manitoba  
R0G 2V0\_

Mary F. McLeod  
Box 246  
Treherne, Manitoba  
R0G 2V0\_

Robert William Daniels  
P.O. Box 26  
Pierson, Manitoba  
R0M 1S0\_

Harold Herbert Mayes and  
Loretta Mae Mayes  
Lyleton, Manitoba  
R0M 1G0\_

Amoco Canada Petroleum Company Limited  
Box 200, Station "M"  
Calgary, Alberta  
T2P 2H8\_

John Murray  
Box 3  
Pierson, Manitoba  
R0M 1S0\_

Sceptre Resources Limited  
3100 - 150 - 6th Avenue S.W.  
Calgary, Alberta  
T2P 3Y7\_

Wang Oil Properties Ltd.  
c/o Fred L. Wang  
General Delivery  
Pierson, Manitoba  
R0M 1S0\_

Patricia Ann Flueher  
R.R. 2, 152J  
Buffalo Lake, Minnesota\_

*no area  
code*

Neil Robert Silker  
2410 Red Leaf Court  
Windom, Minnesota  
56101\_

Donald Keith Silker  
Route 2, P.O. Box 245  
Hector, Minnesota  
55342\_

Donald Silker  
Route 2, P.O. Box 245  
Hector, Minnesota  
55342\_

Paul Kielhorn and  
Harold Freberg  
Executors of Estate of Amanda Freberg  
29 Langley Street  
Regina, Saskatchewan  
S4S 3V5\_

Kenneth James Lee  
Box 35  
Pierson, Manitoba  
ROM 1S0\_

Frank George Crossman  
Box 212  
Pierson, Manitoba  
ROM 1S0\_

Governing Council of the Salvation Army  
Canada West  
c/o Pollock Co.  
1610 - 155 Carlton Street  
Winnipeg, Manitoba  
R3C 3H8

Attention: Mr. Harvey Pollock\_

Ronald La Verne Mayes  
c/o G.D. Drier  
Box 81  
Pierson, Manitoba  
ROM 1S0\_

Gerald Dordon Drier  
Box 81  
Pierson, Manitoba  
ROM 1S0\_

10

William John Olson  
Box 234  
Pierson, Manitoba  
ROM 1S0\_

Thomas Dale Bonner  
Box 206  
Punnichy, Saskatchewan  
SOA 3C0\_

Albert Edward Hoskin  
357 George Street  
Cobourg, Ontario  
K9A 3V5\_

Caryle Energy Ltd.  
700 - 1122 - 4th Street S.W.  
Calgary, Alberta  
T2R 1M1\_

Pembina Resources Limited  
P.O. Box 1948  
Calgary, Alberta  
T4V 1X8\_


Robert J. Kleinman  
1409 Willow Street  
Minneapolis, Minnesota  
55403\_

Ethel Veazie  
5438 E. Baltimore  
Mesa, Arizona  
8887\_

Eikanger Minerals Ltd.  
Box 252  
Pierson, Manitoba  
ROM 1S0\_

OMEGA - CGU - see page 2.

LASTDITCH INVESTMENT LTD.

9  4th fl. - 714-1st Street SE  
Cal.  
T2G 2G8

74800 Manitoba Ltd.  
Box 120  
Pierson, Manitoba  
R0M 1S0

Robert Henry Kielhorn  
15495 Madrona Drive  
Surrey, B.C.  
V4A 5N2

—  
Toronto General Trusts Corp.  
Box 570  
Brandon, Manitoba  
R9B 3W6

—  
Everett Lyle Smith  
Box 122  
Pierson, Manitoba  
R0M 1S0

—  
Emily Joan Monteith  
1142 Buchanan Boulevard  
Winnipeg, Manitoba  
R2Y 2A8

—  
Kevin Paul Kielhorn  
111 Youville Street  
Winnipeg, Manitoba  
R2H 2R9  
—  
Merlin Vanstone, Robert Johnson  
and Sonja Keating  
c/o Sonja Keating  
Box 69  
Carievale, Saskatchewan  
S0C 0P0

—  
Patricia Ann Boyd  
2520 Renzoni Road  
Mississauga, Ontario  
L5K 1W9

—  
Carolyn Beth Allison  
Box 96  
Elkhorn, Manitoba  
R0M 0N0

—  
Isabelle Boyd  
Box 248  
Pierson, Manitoba  
R0M 1S0  
—

John Graham Kielhorn  
13619 Kiamath Falls  
Houston, Texas  
U.S.A. 77041

Royal Trust Corp. of Canada  
(A/C Estate of Lovell G. Stevens)  
Box 748  
Winnipeg, Manitoba  
R3C 2M2

—  
Robvest Minerals Ltd.  
Box 250  
Pierson, Manitoba  
ROM 1S0

—  
Campbell Oil Properties Ltd.  
Box 84  
Pierson, Manitoba  
ROM 1S0

—  
Douglas D. and Isabelle M. Southam  
Box 243  
Melita, Manitoba  
ROM 1L0

—  
61509 Manitoba Ltd.  
129 Main Street  
Melita, Manitoba  
ROM 1L0

—  
H.M. Riddell Holdings Ltd.  
Box 143  
Pierson, Manitoba  
ROM 1S0

—  
Raymond George Browton  
23 English Place  
Winnipeg, Manitoba  
R2M 5J1

—  
Carol Diane Mayes  
Box 146  
Lyleton, Manitoba  
ROM 1G0

—  
Sandy Frederick Drier  
Box 93  
Pierson, Manitoba  
ROM 1S0

—  
Roland Laverne Mayes  
Box 41  
Lyleton, Manitoba  
ROM 1S0

—  
Leona Ilene Mayes  
Box 41  
Pierson, Manitoba  
ROM 1S0

Robert William Daniels  
P.O. Box 26  
Pierson, Manitoba  
ROM 1S0\_

Harold Herbert Mayes and  
Loretta Mae Mayes  
Lyleton, Manitoba  
ROM 1G0\_

Amoco Canada Petroleum Company Limited  
Box 200, Station "M"  
Calgary, Alberta  
T2P 2H8\_

John Murray  
Box 3  
Pierson, Manitoba  
ROM 1S0\_

Sceptre Resources Limited  
3100 - 150 - 6th Avenue S.W.  
Calgary, Alberta  
T2P 3Y7\_

Wang Oil Properties Ltd.  
c/o Fred L. Wang  
General Delivery  
Pierson, Manitoba  
ROM 1S0\_

Patricia Ann Flueher  
R.R. 2, 152J  
Buffalo Lake, Minnesota\_

Neil Robert Silker  
2410 Red Leaf Court  
Windom, Minnesota  
56101\_

Donald Keith and Donald Silker  
Route 2, P.O. Box 245  
Hector, Minnesota  
55342\_

Paul Kielhorn and Harold Freberg  
Executors of Estate of Amanda Freberg  
29 Langley Street  
Regina, Saskatchewan  
S4S 3V5\_

Kenneth James Lee  
Box 35  
Pierson, Manitoba  
ROM 1S0\_



Frank George Crossman  
Box 212  
Pierson, Manitoba  
ROM 1S0\_

Governing Council of the Salvation Army  
Canada West  
c/o Pollock Co.  
1610 - 155 Carlton Street  
Winnipeg, Manitoba  
R3C 3H8

Attention: Mr. Harvey Pollock\_

Ronald La Verne Mayes  
c/o G.D. Drier  
Box 81  
Pierson, Manitoba  
ROM 1S0\_

Gerald Dordon Drier  
Box 81  
Pierson, Manitoba  
ROM 1S0\_

William John Olson  
Box 234  
Pierson, Manitoba  
ROM 1S0\_

Thomas Dale Bonner  
Box 206  
Punnichy, Saskatchewan  
S0A 3C0\_

Albert Edward Hoskin  
357 George Street  
Cobourg, Ontario  
K9A 3V5\_

Caryle Energy Ltd.  
700 - 1122 - 4th Street S.W.  
Calgary, Alberta  
T2R 1M1\_

Pembina Resources Limited  
P.O. Box 1948  
Calgary, Alberta  
T4V 1X8\_

Robert J. Kleinman  
1409 Willow Street  
Minneapolis, Minnesota  
55403\_

54-63

Ethel Veazie  
5438 E. Baltimore  
Mesa, Arizona  
8887\_

Eikanger Minerals Ltd.  
Box 252  
Pierson, Manitoba  
ROM 1S0\_

Lastditch Investments Ltd.  
4th floor, 714 - 1st Street S.E.  
Calgary, Alberta  
T2G 2G8\_

T. R. Daniels and J. M. K. Daniels  
General Delivery  
Pierson, Manitoba  
ROM 1S0\_

K. Daniels and G. F. Douglas  
General Delivery  
Sub. P.O. 6  
Brandon, Manitoba  
R7B 0M0\_

Estate of Lowell Gough Stevens  
Royal Trust Corporation of Canada  
Box 748  
Winnipeg, Manitoba  
R3C 2M2\_

Audry Elaine Carr  
576 Johnson Avenue East  
Winnipeg, Manitoba  
R2L 1A8\_

Ryan James Carr  
Box 401  
Gillam, Manitoba  
R0B 0L0\_

Ardeen May Sokalski  
733 Charleswood Road  
Winnipeg, Manitoba  
R3R 1K7\_

Gladys Sarah Patmor  
General Delivery  
Pipestone, Manitoba  
ROM 1T0\_

David James and Stewart John Southam  
Pierson, Manitoba  
ROM 1S0\_

Robyn Henry Lore  
36 Hutton Crescent S.W.  
Calgary, Alberta  
T2V 3B7\_

Moral Re-Armament  
(The Oxford Group in Canada)  
387 Cote Sainte Catherine  
Montreal, Quebec  
H2V 2B5\_

Shell Canada Limited  
400 - 4th Avenue S.W.  
Calgary, Alberta  
T2P 0J4\_

Scurry-Rainbow Oil Limited  
1700 - 324 - 8th Avenue S.W.  
Calgary, Alberta  
T2P 2Z5\_

Chevron Canada Resources  
500 - 5th Avenue S.W.  
Calgary, Alberta  
T2P 0L7\_

East Plains Resources Limited  
1090 - 700 - 9th Avenue S.W.  
Calgary, Alberta  
T2P 3V4\_

T.D.L. Petroleums Inc.  
Box 700  
Carnduff, Saskatchewan  
S0G 0S0\_

Omega Hydrocarbons Ltd.  
1300 - 112 - 4th Avenue S.W.  
Calgary, Alberta  
T2P 0H3\_

Troy Oils Ltd.  
705 - 805 - 85th Street S.W.  
Calgary, Alberta  
T2P 1H7\_

Andrew Thomas Brown  
Box 2157  
Brandon, Manitoba  
R7A 6X5\_

Pearl MacLean  
Ste. 105, 218 - 4th Street  
Brandon, Manitoba  
R7A 3G8\_

Theodore Joseph Artz and  
Rebecca Susanne Artz  
P.O. Box 85  
Lyleton, Manitoba  
ROM 1G0\_

PanCanadian Petroleum Limited  
Box 2850  
Calgary, Alberta  
T2P 2S5\_

South West Oil Limited  
P.O. Box 855  
Melita, Manitoba  
ROM 1L0\_

Sarah Ruby Caney  
Box 1013  
Virden, Manitoba  
ROM 2C0\_

Wayne Gordon, Trent Wayne and  
Adele Celeste Tingey  
Box 95  
Lyleton, Manitoba  
ROM 1G0\_

Ramona Mae Murray  
Box 129  
Melita, Manitoba  
ROM 1L0\_

Edith D.M. Erixon  
Box 39  
Lyleton, Manitoba  
ROM 1G0\_

Kenneth K. Foster  
1820 Abbot Street  
Kelowna, British Columbia  
V1Y 1B5\_

Cautantowit Holdings Ltd.  
26 Mariner Crescent  
Winnipeg, Manitoba  
R2P 0V4\_

Earle Fletcher  
Coulter, Manitoba  
ROM 0G0\_

Norman Glintz and Willis Glintz  
Box 78, Route #2  
Bottineau, North Dakota  
58318\_

Winnifred Anne Law  
Lyleton, Manitoba  
ROM 1G0\_

Muriel May Bird  
Pierson, Manitoba  
ROM 1S0\_

Ralph Raymond Law  
Melita, Manitoba  
ROM 1L0\_

Kathleen Louise Martinovsky  
P.O. Box 1  
Gerald, Saskatchewan  
SOA 1B0\_

Gerald Ralph Dressler  
1116 Rosser Avenue  
Box 954  
Brandon, Manitoba  
R7A 5Z9\_

Kevin Marcus Kearns  
6215 North 31st Drive  
Phoenix, Arizona  
85017\_

Joel Keith Morgan  
59 Beaver Ridge  
Ottawa, Ontario  
K2E 6E2\_

Crossman Petroleums Ltd.  
Box 149  
Pierson, Manitoba  
ROM 1S0\_

The Rural Municipality of Edward  
Box 100  
Pierson, Manitoba  
ROM 1S0\_

Canada Trust Company  
c/o Montreal Trust  
411 - 8th Avenue, S.W.  
Calgary, Alberta  
T2P 1E7\_

George Douglas Hart  
331 Wainwright Road, S.E.  
Calgary, Alberta  
T2J 1H9\_

Charles Thomas and William John Nicoll  
and Mary F. McLeod  
Box 246  
Treherne, Manitoba  
R0G 2V0\_